THE CLARK CONSTRUCTION
GROUP, INC.

CONTRACT NO. V101BC-0036 VABCA-5674

VA MEDICAL CENTER
WEST PALM BEACH, FLORIDA

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OPINION BY ADMINISTRATIVE JUDGE KREMPASKY

This is a sponsored appeal by the named Appellant, Clark Construction Group, Inc. (Clark), on behalf of its subcontractor, The Poole and Kent Company (PKC), the real party in interest. PKC appeals the Respondent, Department of Veterans Affairs' (VA or Government) deemed denial of PKC's $1,228,500 claim for inefficiency and additional engineering effort on Contract No. V101BC-0036 (Contract) for the construction of a new General Medical, Surgical, Intermediate Care and Psychiatric Hospital in West Palm Beach, Florida (VAMC West Palm).

PKC, the principal plumbing/mechanical subcontractor on the project, seeks recovery of the costs of its labor inefficiency and those of its principal subcontractor, United Sheet Metal Company (USM) allegedly caused by the VA. PKC also seeks an equitable adjustment for the alleged, VA-caused additional efforts expended by both PKC and USM to produce coordination drawings for

the project. During the course of the litigation of this appeal, PKC has amended the amount of its claims upward to a total of $1,935,092. Of this amount, $1,351,367 is attributed to PKC and $583,725 to USM.

The Record before the Board consists of the Pleadings; an Appeal File (cited as "R4, tab __") consisting of 28,079 exhibits; 53 exhibits introduced into evidence at the hearing by PKC, cited as "Exh. A-__"); 5 exhibits introduced into evidence at the hearing by the VA, cited as "Exh. G- __"; a joint exhibit stipulating facts, cited as ("Exh. J-_") consisting of the parties' 14 page JOINT COMPREHENSIVE PREHEARING STATEMENT OF FACTS and PARAGRAPHS 1, 2, 3, and 18 of the VA's FACTS TO BE PROVED; the *seriatim* MAIN, RESPONSE, and REPLY BRIEFS (cited as MAIN, RSPSE, or RPLY at ___); and, the 7 volume transcript of the hearing in this matter, held in Washington, DC (cited as "Tr. [vol. #]:__").

FINDINGS OF FACT

General

GLOSSARY

This appeal involves the complete installation of complex plumbing and mechanical systems in a large, new hospital building and certain terms will repeatedly appear. These terms and their definitions follow.

> **COCO**: A "COCO" is a Central Office Change Order. Any unilateral change to the Contract with a value in excess of the cost established or extending the Contract completion by more than the number of days designated by the Contracting Officer (CO) as qualifying for issuance as a Field Change Order was required to be issued by the CO as a COCO. (R4, tab 500)

COSA: A "COSA" is a Central Office Supplemental Agreement. Any bilateral modification of the Contract with a value in excess of a value established or extending the Contract completion by more than a certain number of days designated by the CO as qualifying for issuance as a Field Supplemental Agreement was required to be negotiated and executed by the CO and Clark as a COSA. (R4, tab 500)

Coordination Drawings: Drawings prepared by Clark and its subcontractors prior to commencement of work showing the specific layout of the work of various trades to be installed at VAMC West Palm. The purpose of coordination drawings is to insure that the installation of mechanical, electrical, and other work is coordinated and can be properly accomplished within the affected areas. Coordination drawing preparation begins with the background drawings on which the installations by the various trades are overlain. USM, being the installer of the largest sized installations was responsible for the background drawings and initial detailing of its heating, ventilating and air conditioning (HVAC) installation. (R4, tab 500; Tr. vol. I: 66-70, 112)

FCO: An "FCO" is a Field Change Order. A Field Change Order is a unilateral Contract change with a value up to an amount set by the CO or extending the Contract completion date for a certain number of days as established by the CO. FCOs were authorized to be executed by the VA on-site project management staff under the authority delegated to them by the CO. (R4, tab 500)

FSA: An "FSA" is a Field Supplemental Agreement. A Field Supplemental Agreement is a bilateral Contract modification negotiated by the VA on-site project management staff under the authority delegated to them by the CO. An FSA was limited to the same monetary amount and Contract extension times as those for FCOs. (R4, tab 500)

Interstitial Space: The interstitial space is an eight to nine foot space above each operational or occupied floor of the building. The top of the interstitial space is the floor slab (or roof) above. The bottom of the interstitial space is a corrugated metal deck with lightweight concrete poured on top. There is no interstitial deck in the Mechanical Equipment Rooms (MER). The interstitial space is divided into seven zones as follows:

> S-1 is the floor slab above the interstitial space.
>
> S-2 goes from the bottom of the floor slab to the bottom of the structural beam, a total of 25 inches. The S-2 zone is where the large cast iron waste drainpipes were located for collection purposes.
>
> S-3 is where the main piping and ductwork run north-south out of the mechanical rooms. These runs were known as "boulevards." The waste drains run into this zone from the S-2 zone for distribution purposes.

S-4 is where piping and ductwork mains run out from the boulevards in an east-west direction. These runs were known as "avenues."

S-5 is where piping and ductwork branches, as well as electrical conduit were run out to the ceiling of a particular room. The S-5 zone ran from the top of the interstitial deck to 16" above.

S-6 is the interstitial deck itself.

S-7 is the space between the bottom of the interstitial deck and the ceiling grid. S-7 contains the plumbing, ductwork drops to ceiling grills, medical gas, electrical and sprinkler run-outs to rooms below.

(Exh. A-41; Tr. vol. I: 46-59, 80-81; Tr. vol. IV: 635-647)

Request for Information (RFI): An RFI is the procedure by which Clark notified the VA of questions and problems concerning the VAMC West Palm drawings and specifications and tracked the resolution of those problems and questions. Subcontractors, such as PKC, would submit RFIs to Clark who would either resolve the question or forward it to the VA, identifying it for tracking purposes as agreed between Clark and the VA. An RFI described the problem and sought instruction in the form of additional information, clarification or approval of proposed solutions to problems identified by Clark and its subcontractors. Upon the VA's receipt of an RFI, it would either be answered by the VA site engineering staff or forwarded to the VA's Architect-Engineer (A/E) for response. During the course of the project, Clark developed a system of

identifying "critical" RFIs by the color of the folder in which they were forwarded. The VA agreed to give priority to responding to these "critical" RFIs. (Tr. vol. III: 548-49; Tr. vol. VI: 947-49)

BACKGROUND

On August 20, 1990, the VA issued Invitation for Bids (IFB) No. 8829-AE soliciting bids for construction of a new 400 bed hospital and parking structure in West Palm Beach, Florida (VAMC West Palm). The IFB was amended five times with Amendment No. 5 to the IFB establishing a bid opening date of November 19, 1990. (R4, tabs 500-06)

Clark was the apparent low bidder at bid opening and on January 28, 1991, the VA awarded the $105,978,000 Contract to Clark (then known as the George Hyman Construction Company) for construction of the new 400 bed hospital and parking structure in West Palm Beach, Florida. The VA issued the Notice to Proceed on February 27, 1991, establishing the Contract completion date as August 10, 1994, 1,260 days after the Notice to Proceed. The George Hyman Construction Company subsequently changed its name to the Clark Construction Group, a fact memorialized in a "Novation Agreement" executed by the parties in July 1996 and a unilateral, "Administrative Change" to the Contract issued by the VA Contracting Officer (CO). (Exhs. J-1, G-5)

Clark and PKC executed two subcontract agreements for the VAMC West Palm project on January 28, 1991. The scope of the subcontracts included labor, material, and equipment for the installation of domestic water piping, HVAC systems, heating piping, sanitary/drain/waste/vent piping, medical gas piping, and piping below the slab of the building. PKC's responsibility included installation of underground/underslab piping up to five feet outside the building line where PKC would connect to utilities installed by other Clark

subcontractors. The two subcontracts totaled $19,500,000; one subcontract in the amount of $13.741 million was for material and equipment and the other was $5.759 million for labor. Clark and PKC split the subcontracts because Clark required PKC to bond only the subcontract for labor. PKC subcontracted the HVAC work (primarily the installation of ducts) to USM. (Exhs. A-34, J-1; Tr. vol. I: 40-44)

PKC submitted the second low mechanical subcontractor quote to Clark for the VAMC West Palm project; PKC's quote was approximately $300,000 higher than the low quote and less than $500,000 lower than the third low quote. The other proposers were both large mechanical subcontractors experienced in complex mechanical installations such as those found in hospital construction. PKC is one of the largest mechanical subcontractors in the United States and has extensive experience in installing mechanical systems in new hospitals. USM has also successfully installed HVAC work in a number of new, large hospitals. Both PKC and USM have worked with Clark and each other on numerous projects similar in size and complexity as the VAMC West Palm project. However, neither PKC nor USM (nor their project management personnel) had experience with installations in interstitial spaces. (Exh. A-19; Tr. vol. I: 37-38, 55, 81; Tr. vol. II: 412-13; Tr. vol. V: 835, 887)

The VAMC West Palm structure consists of three connected wings running approximately 810 feet west to east denoted "West", "Center", and "East" Wings, and an "Energy Center" structure adjacent, and connected, to the West Wing. VAMC West Palm is situated on the site of a former golf course where, as is typical of that part of Florida, the land is low-lying and "swampy." The Energy Center was a single level, slab on-grade structure designed to house the main cooling and heating equipment, electrical switchgear, and other major components of the HVAC and piping systems. The West Wing consists of an

at-grade "basement", four floors and a penthouse. The Center Wing has an at-grade basement, nine floors, and a tenth floor penthouse. The East Wing also has an at-grade basement, nine floors and a tenth floor penthouse. (Exh. J-1)

VAMC West Palm is a cast-in-place concrete structure with pre-cast concrete joists utilized on the floors. The exterior is composed of pre-cast concrete panels that included the window system. There are multiple roof elevations; the roof system consists of lightweight, insulating concrete covered by a single ply roof membrane. (Exh. J-1)

The VAMC West Palm design incorporated an interstitial space between floors. The interstitial space holds the majority of piping, electrical, and ductwork servicing the hospital. The design intent of the interstitial spaces was to provide a readily accessible space to install and maintain utilities serving the hospital. (R4, tab 19,536; Exh. J-1; Tr. vol. I: 44, 46; Tr. vol. II: 412-13)

The Contract includes the standard Federal Acquisition Regulation ("FAR"), 48 C.F.R. Chapter 1, and Department of Veterans Affairs Acquisition Regulation ("VAAR"), 48 C.F.R. Chapter 8, clauses usually found in VA

construction contracts, including the following clauses relevant to these appeals:

> COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK, FAR 52.212-3 (APR 1984)
> CHANGES, FAR 52.243-4 (APR 1984)
> CHANGES -- SUPPLEMENT, VAAR 852.236-88(a) (JUN 1987)
> CHANGES -- SUPPLEMENT, VAAR 852.236-88(b) (JUN 1987)
> DISPUTES (ALTERNATE I), FAR 52.233-1 (APR 1984)
> INSPECTION OF CONSTRUCTION, FAR 52.246-12 (JUL 1986)
> INSPECTION OF CONSTRUCTION, VAAR 852.236-74 (APR 1984)
> SCHEDULES FOR CONSTRUCTION CONTRACTS, FAR 52.236-15 (APR 1984)
> SCHEDULE OF WORK PROGRESS, VAAR 852.236-84 (NOV 1984)
> SPECIAL NOTES, VAAR 852.236-91 (JAN 1988
> SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION, FAR 52.236-21 (APR 1984)
> SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION, VAAR 852.236-71 (APR 1984)
> SUBCONTRACTS AND WORK COORDINATION, VAAR 852.236-80 and 852.236-80 (APR 1984)
> SUSPENSION OF WORK, FAR 52.212-12 (APR 1984)
> SUPERINTENDENCE BY THE CONTRACTOR, FAR 52.236-6 (APR 1984)

(R4, tab 500)

Contract Performance

PLANNED CONSTRUCTION SEQUENCE AND METHODOLOGY

Clark originally planned to construct VAMC West Palm using a "horizontal" construction sequence. The planned sequence involved first constructing the piles, pile caps and foundation of the hospital. Clark planned to erect the structure by moving horizontally from west to east. Thus, instead of completing the construction of a hospital wing from the basement to the top floor before moving on to complete another wing, Clark intended to complete the structure of each floor of all three wings before constructing the next floor. For

example, the third floor of the west wing would be constructed; the construction forces would then proceed to build the third floor of the center wing and immediately move on to the third floor of the East Wing. Clark planned to support this construction sequencing with three tower cranes deployed from west to east. The Contract did not specify any particular construction sequence. A critical path method (CPM) progress schedule was required by the Contract for the project. A fully developed CPM employing horizontal construction scheduling logic was never approved by the VA. However, Clark developed an "interim" schedule that reflected scheduling logic using a horizontal construction sequence. (R4, tabs 500-06; Exh. J-1; Tr. vol. I: 100-01; Tr. vol. II: 324-25, 410-11)

Informed by Clark of its planned construction sequencing, PKC bid and planned its activities in the main hospital building assuming a horizontal construction sequence. The Energy Center was essentially a separate project with regard to PKC's responsibilities. (Exh. J-1; Tr. vol. I: 36, 39)

PKC planned on utilizing five continuous six man crews, including a foreman to perform its work. One crew's primary responsibility would be to work independently to complete installations in the Energy Center. In the main hospital structure, PKC installations were planned to follow the USM installation of main duct runs. A PKC crew would follow the USM main duct crew and install trapeze pipe hangers from the structural floor above and "stock" (or place in) the hangers cast iron and copper pipe. It was intended that this work would be accomplished before installation of the interstitial deck. Another crew would install vertical cast iron piping. The third crew in the main hospital structure would rough-in cast iron wall installations and a fourth crew would install the copper wall rough-in work and copper pipe mains. The majority of both PKC and USM installations are on the bottom five floors. (Tr. vol. I: 36, 49, 71-2, 86, Tr. vol. II: 410-421, 433, Tr. vol. III: 439, 450, 539, Tr. vol. IV: 643-44)

Once the pipe hangers were installed and stocked with pipe in the bottom five floors, where the bulk of PKC's work was to be performed, the first two crews would turn to making copper and cast iron connection work within the interstitial spaces. The third crew would accomplish cast iron wall rough-in and the fourth crew would do the same for copper pipe. (Tr. vol. II: 413)

PKC anticipated using a 33 man labor force, including non-working foremen for approximately a two-year period commencing in the early fall of 1991 through the late fall of 1993. PKC anticipated gradually increasing the size of its labor force to the 33 man level, beginning with the on-site installation work in the spring of 1991, until the fall of that year. The PKC labor force would then be gradually reduced starting in the late fall of 1993 through August of 1994. During its anticipated peak period of work (September 91-December 93), using the 33 man workforce, PKC expected to expend approximately 6,000 man-hours per month. USM planned on using a 12 person on-site workforce plus supervision and non-working foremen during its approximately 24 month peak performance period (January 92-January 94). (R4, tabs 28,012, 28,021; Tr. vol. I: 49-53, 96-98; Tr. vol. II: 413, 421)

In performing their work, both PKC and USM planned to use rolling manlifts during the installation of the piping and ductwork prior to placement of interstitial decks. PKC planned to utilize the cranes employed by Clark to hoist the manlifts to each floor. (Tr. vol. I: 76-77, 89-90)

As part of its planned method of construction, PKC intended to prefabricate a substantial portion of the piping and pre-assemble fixture assemblies in its Miami shop and a prefabrication shop located in the former golf course club house on-site. In addition, PKC arranged with its piping and fittings suppliers to "bag and tag" the materials delivered to the site. "Bagging and tagging" materials consists of placing all necessary fittings and other materials

required for a particular location in one box. PKC planned that a production crew would pick up a box when it was going to the designated location and that the box would contain the necessary materials to complete the work in the box. The contents of each box and the sequential delivery schedule for fittings as ordered by PKC was predicated on the horizontal construction schedule. (Exh. J-1; Tr. vol. I: 48-50; 59-60; Tr. vol. II: 411-413, 427, 450; Tr. vol. III: 450)

USM also planned to accomplish horizontal installation because 60 to 70 percent of its work was on the lower five floors. USM planned to order the main trunk lines for each area in the sequence in the initial horizontal sequence schedule. As the trunk lines were delivered, USM expected to install the trunk lines up high in the interstitial space in order to get them out of the way. The trunk lines were to be installed prior to installation of the interstitial deck, and prior to other trades installing their work. Trunk line installation would be accomplished utilizing man-lifts staged to each floor by the Clark site cranes. (Tr. vol. I: 86, 112-14)

USM intended to return after the trunk line installation to install branch lines connecting to the Variable Air Volume (VAV) boxes. These branch lines were located in lower interstitial zones and would be installed after completion of the interstitial deck since its workers could stand on the deck rather than working off of ladders. (Tr. vol. I: 114-116)

USM bid assuming that it would pre-fabricate all of the rectangular sheet metal and purchase pre-cut spiral round pipe. The spiral round pipe had a two month ordering lead time in order to ensure it was on site when needed. (Tr. vol. I: 86-7)

STOP PUMP ORDERS

Since the water table was only three to five feet below grade, extensive de-watering of the site was necessary for construction of the foundations and installation of underslab and site utilities. Clark was responsible for de-watering the site and planned to use a "sock" de-watering system throughout the building site. This de-watering system would have provided a clean, dry and stable project site. (Tr. vol. I: 54; Tr. vol. II: 275-80)

In early-spring 1991, the VA approved Clark's proposed de-watering system. Installation of the first stage of this system took place in late-April and early-May 1991. A "sock" de-watering system is an underground system comprised of pliable rolls of plastic pipe, with perforations, which are installed in trenches using a machine which excavates the soil down to a maximum depth of 16 feet, installs the pipe and then fills the trench. The plastic pipe is covered in a fabric to prevent soil from clogging the pipe, but allows water to pass into the pipe. The pipe is attached to a pump and water is sucked out of the ground, thus lowering the ground water level to that of the pipe. The de-watering system approved by the VA was capable of dewatering the entire site, approximately 35 million gallons of water per day. (Exh. J-1; Tr. vol. II: 274-81)

On May 29, 1991, the South Florida Water Management District (SFWMD) issued a "Stop Pump" Order because the VA had not obtained the permits necessary to pump the volume of water generated by Clark's de-watering activities. The permits were required because of the proximity of VAMC West Palm to a landfill and industrial area and the potential for the migration of contamination because of the volume of water being pumped. At the time of the Stop Pump Order, foundation work for the Energy Center and West Wing was complete. Work on the deep foundations in the Center and East Wings, although restricted, continued during the duration of the Stop Pump Order. In some

cases, Clark accomplished installation of the Center and East Wing foundation piles using limited, spot de-watering. PKC was able to accomplish limited installation of its underslab, underground pipe where de-watering was not necessary for installation for the duration of the Stop Pump Order. Installation of site utilities such as storm drainage by other Clark subcontractors was also impossible in the face of the Stop Pump Order. SFWMD conditionally lifted this Stop Pump Order on August 15, 1991, requiring extensive revisions to the de-watering system employed and severe limitations on the amount of water that could be pumped on a daily basis before dewatering was resumed. (Exh. J-1; Tr. vol. II: 284-85; Tr. vol. VI: 963-66)

The revised de-watering system was complete on October 2, 1991 and Clark was able to reinitiate de-watering activities on that date. The limited de-watering permitted after the lifting of the May 1991 Stop Pump Order allowed completion of the foundations for the Central and West Wings of VAMC West Palm by early-December 1991. However, because of the pumping limitations, PKC was prevented from installing underground utilities concurrent with the foundation work. This, in turn, did not allow construction of slabs in the Energy Center, and the Center and West Wings. Consequently, PKC, having ordered Energy Center equipment for delivery in the first quarter of 1992, was forced to install the equipment on pads or to store it on site in mucky areas until it could be installed. (Exh. J-1; Tr. vol. II: 284-87, 293; Tr. vol. III: 445-49; 518,19, 544; Tr. vol. IV: 655)

Pursuant to SFWMD mandated testing and monitoring, arsenic contamination of the groundwater at the site was discovered and, as a consequence, SFWMD issued a Second Stop Pump Order on December 4, 1991. The Second Stop Pump Order was not lifted until September 24, 1992 after Clark's further extensive revision of the de-watering system. Site de-watering

resumed on October 26, 1992. Completion of site storm drains and connection of rain leaders to the storm drain system was impossible until the second Stop Pump Order was lifted. After the rescission of the Second Stop Pump Order, storm drain installation resumed in the third week of November 1992 when a required holding basin was constructed. (Exh. J-1, Tr. vol. II: 294-96)

While the Second Stop Pump Order was pending, connection of rain leaders in the Energy Center and West Wing to the roof drains and connection of the leaders to the storm drainage or de-watering system was precluded. Rain leaders already installed had to be plugged to insure water would not enter the storm drains. (Exh. J-1; Tr. vol. II: 295-96, 309-10; Tr. vol. III: 452)

Clark was never able to operate the installed sock de-watering system; during the releases of the Stop Pump Orders Clark was able to perform limited de-watering utilizing either an open pump system or a limited, well point de-watering system. SFWMD required revisions eventually resulted in Clark installing a "well point" system of less capacity than the sock system used in combination with weirs and holding basins for the site. A well point system is a series of 25-foot long perforated steel rods driven into the ground every two feet. The rods come up out of the ground and attach to a large header pipe lying on the ground. The header pipe is connected to a pump and water is extracted from the ground by means of this system. (Exh. J-1; Tr. vol. II: 285-95)

CONSTRUCTION RESEQUENCING

As a consequence of the First Stop Pump Order, Clark re-sequenced the job from the planned horizontal to vertical construction. Consequently, Clark commenced vertical construction of the West Tower where the foundation was complete while concurrently, on a limited basis, continuing East and Center Wing foundation work. The Interim Critical Path Method (CPM) schedule

required by the Contract, still under development at the time the first Stop Pump Order was issued, was abandoned. The actual, CPM schedule approved by the VA incorporated the revised construction sequencing. In accordance with the Contract requirements for CPM preparation, this initial CPM reflecting vertical construction did not reflect actual construction times related to the first fifteen months of construction. (R4, tabs 299, 500; Exh. J-1; Tr. vol. II: 282, 284-85, 321-23)

Clark decided to resequence the construction shortly after the First Stop Pump Order. However, PKC was neither consulted about Clark's decision to change the construction sequence nor did PKC provide any input into the development of the "vertical" schedule. Clark did not inform PKC of the change to the construction sequence until October 1991. (Tr. vol. I: 73; Tr. vol. II: 284, 344-47; Tr. vol. III: 475; Tr. vol. V: 835-858)

Clark originally planned to install the prefabricated metal stairs for the building as each floor went up. Clark did not adjust the delivery and installation schedules for the stairs when it went to vertical sequencing. Consequently, PKC and USM experienced substantial difficulty in moving men and materials between floors because they were required to use unstable site constructed wooden "ladders" to move from floor to floor instead of having stairs available. Stairs were installed in the West Tower between mid-May 1992 and mid-January 1993, in the Center Tower between late-June 1992 and mid-December 1993 and in the East Tower between early-November 1992 and late-November 1993. Clark also did not increase the number of man and material lifts when it went to vertical construction sequencing. This resulted in all trades, including PKC and USM, experiencing substantial delays in moving its men and materials to work sites on the various floors. (R4, tabs 1429, 27,506, 27,507; Tr. vol. III: 483-85, 523-24; Tr. vol. VI: 956-57, 1080)

PKC's "bag and tag" material delivery arrangements were not revised upon being informed that the construction sequence was changed from horizontal to vertical. Consequently, to accommodate the vertical sequencing, the containers of materials delivered had to be broken down and material for each day's work located and separated by PKC's crews. This resulted in PKC having difficulty providing materials to its crew necessary to support continual production and required additional personnel to support material breakout and conveyance of materials to the production crews. (Tr. vol. II: 427; Tr. vol. III: 451, 456-57)

The plan for prefabricating pipe and pipe assemblies was essentially abandoned with the sequence change because a prerequisite of the prefabrication process was completed coordination drawings detailing the exact pipe lengths and configuration. PKC also lost the use of the old clubhouse as a prefabrication shop for later installations as a result of the sequence change when Clark demolished it as required. PKC had to piece together its pipe on site; in particular, the sequence change prevented the prefabrication of large diameter heavy pipe in the Energy Center. (Tr. vol. II: 435; Tr. vol. IV: 662, 737-38)

From the spring of 1991 to February 1992, PKC and USM were performing without a plan or schedule, which resulted in substantial confusion of the PKC workforce and friction between PKC project management and its field forces. As a consequence, a PKC project manager characterized the PKC labor budget for the job as "going to hell" in 1992. Throughout construction of the project, PKC did not perform or plan its work based on a schedule. Mr. Conn, then PKC's Project Superintendent and later hired by the VA, characterized the manner in

which PKC's work proceeded thusly:

> And it just kind of --- you know, look out the window and see where they was going type of thing, because we could never get a schedule out of them. So we kind of followed Hyman [Clark] wherever they went.

(Tr. vol. III: 453, 455, 475; Tr. vol. IV: 658-59; Tr. vol. VI: 1067-68)

ROOF INSTALLATION

The Contract specified a roofing system comprised of a lightweight insulating concrete roof deck covered by a polyvinyl chloride (PVC) single ply membrane that was to be fully adhered to the roof deck. The specifications also required that the installed roof membrane comply with the Factory Mutual (FM) I-90 Windstorm and Underwriter's Laboratory (UL) Class A Fire Hazard classifications. The specified roof membrane was required to have a felt backing and was to be adhered to the roof deck with glue. (R4, tab 570; Exh. J-1; Tr. vol. II: 300-01; Tr. vol. IV: 627)

Clark made its initial submittal of a "Geoflex" roof membrane system on October 21, 1991; the VA rejected this submittal on December 17, 1991 because the membrane material submitted was poly isobutylene, not PVC. Clark's next submittal for a "Cooley" PVC roof membrane system on January 24, 1992 was also rejected on March 31, 1992. This second submittal was rejected for multiple reasons, including the failure to comply with FM I-90, improper thickness of the PVC, and the use of asphalt as the membrane adhesive instead of glue. Various aspects of the "Cooley" roof system were rejected between April and September 1992. The "Cooley" roof system submittal saga culminated with the VA's rejection of the system on September 24, 1992. The VA rejection was based on several aspects of the "Cooley" roof system not being in compliance with

Contract specifications. Clark then proposed use of a "Sarnifil" membrane roofing system in the latter part of September 1992; the VA approved this submittal at the end of September 1992. Clark's roofing subcontractor began roofing installation on October 27, 1992 after the lifting of the second Stop Pump Order and connection of roof leaders to storm drains. (R4, tab 1598; Exhs. A-51; J-1; Tr. vol. VI: 921-28)

FM rescinded its I-90 Windstorm classification of all single ply roof membranes in July 1991; thus, no roof system as specified in the Contract could comply with the Contract requirements at the time of Contract award. The FM recission of the I-90 rating was based on FM adding a hail damage requirement to the standard, a standard a single ply roof membrane could not meet. The primary VA concern in specifying FM I-90 compliance was resistance to wind lift. At a meeting in June 1992, the VA informed Clark that it would accept evidence that a roofing system complied with FM I-90 on or before June 1991 as compliance with the specification, essentially waiving the hail damage resistance requirement. Clark never presented evidence of the "Cooley" roof system's pre-June 1991 FM I-90 compliance. (R4, tab 1598; Exhs. J-1; A-51; Tr. vol. II: 300-03, 308-09; 368; Tr. vol. IV 621, 624-26)

Mr. Daniel F. Wilkins, P.E., of the firm Donnel and Wilkins, in an August 28, 1998, report furnished Clark in relation to other appeals relating to the Contract, concluded that the VA roofing specification was a "proprietary" specification that only the Sarnifil roof system could meet. His conclusion was based on the fact that only the Sarnifil fleece backed membrane over lightweight concrete system had an FM I-90 certification prior to June 91. (R4, tab 28,023)

The lightweight insulating concrete and roof membrane comprising the roof system could not be installed until roof drains were operational. The roof drains, plugged during the pendency of the Second Stop Pump Order, could not

be unplugged until the drains could be connected to an operational storm drainage system. (R4, tab 28,029; Tr. vol. II: 295-96, 343-44, 309-10, 452; Tr. vol. VI: 994-96)

Roof installation was not on the critical path in the approved CPM schedule submitted by Clark. The approved project CPM establishes the following schedule for roof installation:

ROOF	EARLY START	EARLY FINISH	LATE START	LATE FINISH
ENERGY CENTER	3/17/92	4/6/92	2/17/94	3/16/94
2ND FLR. WEST (S)	3/11/92	3/12/92	3/15/94	3/16/94
2ND FLR. WEST (N)	4/13/92	4/20/92	3/23/94	3/30/94
4TH FLR. WEST	4/21/92	4/18/92	3/31/94	4/27/94
PENTHOUSE WEST	5/19/92	5/22/92	4/28/94	5/3/94
2ND FLR. CENTER	10/22/92	10/23/92	5/20/94	5/23/94
BASEMENT EAST	10/30/92	11/2/92	5/31/94	6/1/94
1ST FLR. EAST	11/3/92	11/9/92	6/2/94	6/8/94
2ND FLR. EAST	11/10/92	12/3/92	6/9/94	6/29/94
3RD FLR. EAST	12/4/92	12/7/92	6/30/94	7/1/94
9TH FLR. EAST	8/31/93	9/16/93	7/5/94	7/20/94
9TH FLR. CENTER	9/17/93	10/4/93	7/21/94	8/5/94
PENTHOUSE CENTER	10/5/93	10/6/93	8/8/94	8/9/94

(R4 tabs 299, 1439; Exh. G-5)

Similarly, installation of storm drains was not on the critical path of the approved schedule as reflected below.

STORM DRAINS	EARLY START	EARLY FINISH	LATE START	LATE FINISH
AREA 1	12/23/91	1/12/92	4/28/94	4/28/94
AREA 2	1/3/92	1/13/92	5/9/94	5/17/94
AREA 3	1/14/92	1/22/92	5/18/94	5/26/94
AREA 4	1/23/92	2/5/92	5/27/94	6/10/94
AREA 5	2/6/92	2/19/92	6/3/94	6/24/94
AREA 6	2/20/92	3/11/92	6/27/94	7/18/94
AREA 7	3/12/92	3/25/92	7/19/94	8/11/94
RAMP	3/26/92	4/4/92	8/2/94	8/9/94

(R4 tabs 299, 1439)

Clark completed installation of the Energy Center roof in late-1992. The West Tower and lower roofs of the Center Tower were completed in the first quarter of 1993; the second quarter of 1993 saw completion of the lower roofs of the East Tower. The East Tower high roof was completed in the third quarter of 1993; the Center Tower roofing was completed by the end of 1993. (Exh. J-1)

WET CONDITIONS

PKC planned to install the cast iron riser piping for the roof drain systems as the three towers were erected. These risers, pipe of 12" diameter or larger, when connected to an operable site storm sewer system, could have been utilized as a temporary method of draining the decks as the building went up. The temporary drainage could be effected by installing temporary hub drains on the storm risers penetrating a slab on the slab bottom in order to permit water on a slab to be channeled to the hub drains as the building went up. This channeling would be accomplished by placing sand bag "dikes" on a slab and using labor to "squeegee" water between the dikes to the temporary hub drains. PKC, by the testimony of Mr. Spors, PKC's project manager, asserts that it planned to utilize the risers as temporary deck drains in this manner. However, there is nothing else in the Record supporting Mr. Spors' assertion nor is there evidence that such temporary drainage was ever proposed during performance. In addition, the risers penetrated the slabs through sleeves constructed into the concrete deck. These sleeves protruded above the slab; the protruding sleeve would result in a residue of water left on the deck even if temporary hub drains were employed. (Exhs. A-40, A-50; Tr. vol. I: 61-62, vol. II: 296-99, 419, 428, 508-12, Tr. vol. III: 507-17, Tr. vol. VI: 938-48, 1070; Tr. vol. VII: 1202-18)

While the Stop Pump Orders were in effect, storm risers in the building could not be made operational because either the site storm drains could not be

installed or, if installed, the rain leaders could not be connected to them. This lack of operability of the storm risers meant that, once the building was topped out, there was no place to drain the water. If storm drains, including the storm risers in the building and the underground storm lines, are operational, water can be channeled off the roof deck into storm drains even if the roofing membrane system is not installed. If the water can not be directed off the floor and roof decks and into the storm drains, water stays on site contributing to muddy site conditions and water dripping through the building.
(Tr. vol. II: 295-6; Tr. vol. VI: 1097)

For a substantial part of the year, West Palm Beach experiences near-tropical conditions resulting in substantial, almost daily rain. Winter months generally include rainy periods but the other months exhibit tropical conditions with rain to be expected nearly every day. Rainwater dripped onto the workers through cracks in the slabs and through penetrations built into the slabs for various utilities. As water dripped down from above, it would eventually pool in the depressed slabs located in the basement of all three towers of VAMC West Palm. The standing water on the depressed slabs caused PKC labor to have to take care with its power cords to keep them out of the water and, at times, prevented layout work.
(R4, tabs 27,538, 27,541; Tr. vol. I: 61, 108-109; Tr. vol. II: 428-29, 432; Tr. vol. III: 507-23, 529-38; Tr. vol. IV: 673-76)

The inability to de-water the site persisted until the Second Stop Pump Order was lifted. This inability to de-water meant that site conditions outside the building were mucky during a substantial part of PKC's and USM's work. These conditions caused both USM and PKC logistical problems. PKC could not stop deliveries of equipment for the Energy Center air handler units, boilers and chillers, and fuel tanks. However, PKC was prevented from installing

underground piping, tanks and mechanical equipment, or erecting the cooling tower in and around the Energy Center as planned. As a result, material and equipment had to be stored on site, and later moved a second time to the place of installation, which resulted in a double handling of material. This material and equipment had to be stocked on-site in a mucky area. (Tr. vol. III: 445-49, 518-19, 544; Tr. vol. IV: 655)

USM was forced to bring a separate four-wheel drive vehicle on site because the mucky ground prevented trailers from getting close enough to the building for hoisting of the main trunk lines. USM's planned performance method was to bring prefabricated ductwork directly to the building for immediate lift to the installation location in the building. This circumstance lasted for over a year until the site de-watering and storm drain systems were completed. Forced to store its materials, USM had to store it on blocks because there was standing water in the building. USM was required under their union agreement to employ union sheet metal workers for material handling, *i.e.*, unloading trucks and moving materials into place. (Tr. vol. I: 107-109, 191-193)

Due to problems with other Clark subcontractors, there were delays in installation of exterior concrete panels and windows and in making the building watertight. This also contributed to wet conditions in the building. PKC regularly complained to Clark because of water dripping in the building. A method routinely employed by contractors to reduce the impact of water dripping from slabs above is to temporarily seal penetrations on the deck above with mastic and plywood. Though PKC proposed such temporary sealing measures to Clark, neither Clark nor PKC ever undertook to implement these or other measures to mitigate water intrusion. Mechanical contractors normally expect to work in wet conditions since the majority of their work usually is accomplished prior to a building being made watertight. Mr. Spors of PKC

testified that, while PKC anticipated working in a "minimal" amount of water, it expected 75% of its work to be accomplished with the roof installed and the roof drains operational. (R4, tab 72; Tr. vol. V: 886-909; Tr. vol. VI: 936, 1068-70, 1095-97; Tr. vol. VII: 1213-15)

COORDINATION DRAWINGS, CONSTRUCTION SEQUENCE AND RFIS

Clark was obligated under the Contract to coordinate the work of its subcontractors. This coordination included the production of "coordination drawings" in which the various construction trades detail the exact location and configuration of their various installations. Because its installations are generally the largest and least flexible, PKC had the responsibility to first detail the coordination drawings. In early 1991, PKC, USM and Clark agreed upon a coordination drawing schedule to complete coordinated drawings for the duct work and piping on a floor-by-floor, west to east, horizontal basis starting at the Energy Center. This schedule, as is usual, anticipated that the coordination drawings would be prepared in the same sequence as planned for construction and would result in the coordination drawings being completed prior to work beginning in any part of the building. Coordination drawings for each floor and each interstitial space were required. PKC and USM intended to complete their drawings by USM preparing background drawings locating its ductwork. The next step would be for PKC, utilizing the background drawings, to locate its piping work on each of the interstitial floors and the mechanical rooms. PKC would also be able to check for conflicts between its piping and USM's ductwork. Thereafter, the coordination drawings would be provided to Clark's other subcontractors for them to locate the installation of their work. The coordination drawings, in addition to being required by the Contract, were critical to the

efficient progress of the project. (Exh. A-35; Tr. vol. I: 46-47, 66-7, 100-02; Tr. vol. II: 415-16, 422 324; Tr. vol. III: 450; Tr. vol. IV: 631, 633-34; Tr. vol. V: 855-57)

USM planned on a six to seven month effort for coordination drawings; PKC anticipated a six to eight month effort. It was planned that the PKC and USM coordination drawing effort would be accomplished beginning in March 1991 and ending by January 1992. USM's coordination drawing effort required 18 months; PKC needed almost 24 months to complete its effort. PKC expected that its coordinated drawing effort would be completed prior to any actual duct or pipe installations taking place. Fully completed and approved coordinated drawings were necessary because USM planned to have the spiral duct sections to be used in the project shop cut to length. USM's spiral duct supplier had a 6-8 week lead time requirement for the custom cut spiral duct. (Exh. J-1; Tr. vol. I: 87, 98-100; Tr. vol. II: 264; Tr. vol. IV: 661-64, 671, 766-7, 808)

The construction sequencing drove the sequence of coordination drawing preparation because PKC and USM had to design openings in floor slabs for its installations and needed complete interstitial space drawings prior to the slab or interstitial deck being poured. In addition, PKC needed the equipment to be installed so that measurements for prefabricated pipe in the energy center could be taken. (Tr. vol. I: 100-103; Tr. vol. II: 414, 419)

Clark initiated a total of 3,019 RFIs (612 per year) during the course of the project. It would be reasonable to expect around 1,000 RFIs per year on a project of the size and complexity of the VAMC West Palm project. RFIs related to the scope of PKC's work were designated as mechanical (M) or plumbing (P) RFIs. RFIs related to Contract changes carried a (X) designation. There were 330 M, 386 P and 34 X (a total of 750) RFIs relating to PKC's and USM's work during the project. Most of the PKC related RFIs were generated during the course of the

USM and PKC primary coordination drawing effort in 1991 and 1992. (Exhs. A-42, J-1; Tr. vol. I: 98; Tr. vol. II: 255)

There is no Contract provision wherein the VA represents any specific length of time it would take to respond to an RFI. Mr. MacClugage, the PKC Project Manager, asserts that representatives of Clark told him that the VA had committed to respond to RFIs within 14 days. Consequently, PKC represents that anytime an RFI response exceeded 14 days, the response time is excessive. The VA responded to 26% of M and P RFIs within the time requested in the RFI. The VA's failure to respond to most M and P RFIs within 14 days forms the basis of PKC's general characterization of the VA's RFI response time as excessive. (Exhs. A-38, A-42, J-1; Tr. vol. IV: 664-65)

Generally, there were no personnel from the VA's architect-engineer (A/E) on site. The VA forwarded most RFIs on the project to the A/E for resolution. In contemporaneous correspondence and evaluation, the VA characterized the A/E's RFI response time and the quality of the responses to RFIs as "inadequate" and rated the A/E's performance during the construction period as poor. (R4, tabs: 28,027, 28,069, 28,071, 28,075; Tr. vol. IV: 742)

In 1991 and 1992, USM encountered various conflicts in the drawings between sheet metal duct work shown and the architectural and structural features of the building or manufacturers' requirements. These conflicts, particularly conflicts between drawing locations of equipment and components to be placed in ducts and locations specified by the equipment manufacturers, which became the subject of various RFIs, prevented USM from completing its coordination drawings until late-1992 when the RFIs were resolved. There were 138 USM initiated RFIs, a number that USM's Project Manager does not believe

was excessive for a project the size of VAMC West Palm. (Exhs. A-1-18, A-37, A-38, J-1; Tr. Vol. I: 104, 121, 180-83, 168-69; 227-28; Tr. vol. II: 238-41; Tr. vol. III: 582-86)

The change of construction sequence and the VA's inability to respond quickly to RFIs affected PKC/USM coordination drawing preparation. When the construction sequence changed from horizontal to vertical, USM was forced to redirect the background and coordination drawing effort that it had already begun. It could not complete those drawings because its RFIs, particularly the duct component RFIs, were not being answered. As a consequence, PKC was forced to prepare its coordination drawings independent of USM because USM had to catch up on the background coordination drawings. To accomplish this, PKC engaged the services of an outside drafting company to do its coordination drawings, including adding the background ductwork. (Exhs. A-37; A-38; Tr. vol. I: 121, 156; Tr. vol. II: 238-40, 257-64, 438; Tr. vol. III: 458-68, 526, 547-50, Tr. vol. IV: 663-67, 806)

In addition to the duct component spacing problems, there were several other specification and drawing conflicts that impacted USM's coordination drawing efforts. There was insufficient space (height) provided in the acoustical ceiling plenum to make necessary offsets required to accomplish coordination. The grills for the HVAC reflected in the contract ceiling plans were not coordinated with the location of the variable air volume (VAV) boxes in the interstitial spaces. Ductwork shown on mechanical drawings could not be installed in the general locations designated due to interference with precast beams and joists. The location of fume hoods for laboratory and kitchen appliances conflicted with the architectural locations of the equipment shown on the architectural plans for kitchen and wet labs. (R4, tab 28,066; Tr. vol. I: 161-63, 196-98, 200-05, 220-21)

PKC's coordination drawing effort was similarly impacted by the identification of various conflicts between architectural, structural and mechanical drawings. PKC initiated 612 RFIs. PKC identifies 122 of these RFIs as impacting its work or coordination drawing efforts. 67 of the 122 "impacting" RFIs resulted in 40 Contract change orders. The "impacting" RFIs were identified by Mr. MacClugage by his preparation of spreadsheets based on his review of the Contract RFI file. On the spreadsheets, Mr. MacClugage noted the identity of the RFI, his assessment of the response time to the RFI and whether the time was excessive, his conclusions regarding the working crew or coordination drawing effort affected or disrupted, the area affected and whether an FCO resulted from the RFI. From his spreadsheets, Mr. MacClugage prepared a summary identifying the RFIs that impacted productivity. This summary identifies some major issues relating to the delayed RFI responses affecting coordination drawing preparation. The Contract mechanical drawings showed piping locations which were not coordinated with the structural drawings and resulted in numerous RFIs that occurred from the fall of 1991 through 1992. The more than two month average RFI response time to resolve these issues disrupted the coordinated piping drawing effort throughout the lower four floors of the West, Central, and East Towers. Because of conflicts between the mechanical and the architectural design, the locations of the cast iron risers interfered with various architectural features and disrupted PKC's coordinated drawing efforts. (R4, tabs 28,067, 28,063; Exh. A-42; Tr. vol. II: 327-31, 437-40, 452-446; Tr. vol. III: 547-88; Tr. vol. IV: 661-707, 744-57, 761-77)

Average RFI response times for significant PKC initiated inquiries were:

Issue	Days
Structural Dimension Conflicts	38
Storm Riser Conflicts	71
Fixtures With No Utility Services Identified	76
Telecar Conflicts	235
Medical Gas System Conflicts	63
Drain Conflicts	67
Pipe/Ductwork/Conveyor System Spatial Conflicts	112
Special Area/Systems Conflicts	61
Pipe Riser Wall Dimension Conflicts	55

USM estimated that the average response time for RFIs it initiated was 45-50 days. (Exhs. A-37, A-42; Tr. vol. IV: 728-29, 741, 760, 773)

The Government's expert, Ms. Sisk, acknowledged that Mr. MacClugages' spreadsheets accurately reflected the RFIs on the project, the response times, and the areas, systems or work the RFIs may have affected. Ms. Sisk also acknowledged that delayed RFI responses could cause impact to labor productivity and coordination drawing preparation. (Tr. vol. VII: 1152, 1194)

Clark, at various times during the project, complained of PKC's and USM's dilatory or inaccurate coordination drawing efforts, particularly because PKC was holding up the work of Clark's electrical subcontractor. These problems occurred early in the effort as PKC was transitioning to the vertical sequence after Clark informed it of the change. Clark's failure to adhere to the vertical sequence CPM also affected the continuity of the PKC/USM coordination drawing effort because of the need to have the drawings completed before starting work. (R4, tabs 27,522, 27,529, 27,531, 27,549; Tr. vol. III: 433, 455, 475, 593-600; Tr. vol. IV: 658-59; Tr. vol. VI: 1075-68)

RFIS AND WORK DISRUPTIONS

PKC asserts that 260 of 750 RFIs initiated relating to PKC's and USM's work adversely impacted labor efficiency. 138 of the RFIs impacted USM and 122 impacted PKC. The impact, as characterized by Mr. MacClugage and Mr. Tammaro in their testimony, encompassed by these RFIs is summarized in this section. (Exhs. A-37, A-38, A-42; Tr. vol. I: 122-24; 147-54; Tr. vol. III: 679-87)

The Contract specified open louvers in the mechanical rooms. The open louvers resulted in rain intruding into the mechanical rooms. This circumstance was corrected by change order to USM in 1995. The open louvers affected USM's labor productivity during its installation of the ductwork in the mechanical rooms in 1992-1994 because USM was forced to use battery powered tools rather than directly connected cords to perform the installations because of standing water. (Tr. vol. I: 224-27)

Design conflicts in wall locations and dimensions disrupted USM and PKC installations causing inefficiency in coordinating the work and installation. Numerous piping sleeves and piping, chair carriers, and other plumbing components would not fit into the wall partitions and wall chases depicted on the Contract drawings. Where partition walls were in corridors, adjacent to bathrooms, or adjacent to case work, labs, operating rooms, and locations where room dimensions were critical, the piping and plumbing components had to be relocated. Wall relocation was not permitted without the VA's approval. Many of the walls could not be relocated because of code requirements, such as those in the bathrooms, requiring strict specification compliance. The corridor walls also could not be moved because the hallways were required to have a minimum width of eight feet. Where there was an ability to change the dimensions of the partitions, the partitions would be furred out to accommodate the piping and/or sleeve by the drywall subcontractor. Where the wall could be moved (room to

room), the wall relocations also necessarily required the relocation of ceiling air devices from the locations shown on the approved coordination drawings or reflected ceiling plans. For instance, with respect to the installation of linear diffusers in the operating room, the VA did not provide a response to USM's RFI, but only noted that they anticipated conflicts. As a result, and because the location of room walls was being determined in the field, USM had to coordinate installation of the diffusers in the field requiring, in some instances, the layout of the ceiling grid pattern on the floor first in order to determine where USM could install its difusers. In some cases, USM would have to install additional fittings or flexible connections to connect ducts to diffusers. A similar problem with diffuser locations resulted from the conflicts surrounding the medical gas installation. Problems with wall location and dimensions continually required the direct attention of USM and PKC supervision to coordinate the work with the other trades and the VA in the field and reduced PKC's and USM's crew supervision. These problems occurred mostly on the basement through fifth floor levels. Amendment Two to the IFB modified Paragraph 3.1 of Specification Section 09100, "Non-Load Bearing Framing System," to include the following subparagraph:

> C. Contractor to thoroughly coordinate the sizes of pipe, insulation, conduit, etc. with available wall thicknesses and increase wall thicknesses, as needed, at no additional cost to the Government.

(R4, tabs 69, 500-05; Exhs. A-1-A-18, A-37-A-38, A-42, J-1; Tr. vol. I: 107-225; Tr. vol. II: 327-31, 437-39; Tr. vol. IV: 644-46, 688-707, 744-58)

Submitted and approved HVAC components did not fit into the mechanical equipment rooms (MER) if they were installed in accordance with the manufacturer's recommended spacing. Three RFIs, affecting 90% of the

MERs, relating to the component spacing issues, were not resolved for over a year. USM had to separately calculate the location for every component and obtain the A/E's approval of the locations in each mechanical room without being able to prepare coordinated drawings. The component spacing issues directly affected on-going work in three MERs. Component spacing questions were resolved prior to initiation of work in other MERs. (Exhs. A-1 – A-18; Tr. vol. I: 166-69, 180-83, 188-89; Tr. vol. III: 582-86; Tr. vol. IV: 647; Tr. vol. VI: 1043-48)

Fume hood redesign in the kitchen and wet labs in the basement and the first floor of the West Tower and in the basement area of the Central Tower and the late issuance of corrective RFIs or changes resulted in hood installation being performed in a piecemeal fashion well after when they were planned to be installed. (Tr. vol. I: 196-98; Tr. vol. III: 554-61)

Installation of duct work and piping work was disrupted by changes, revisions, and omissions in the mechanical work shown for the Canteen and other food service areas on the first floor of the West Tower. The uncertainties related to the installations in the Canteen continued through 1992 and 1993 until the VA finalized the Canteen design. (Tr. vol. I: 172-80, 189-90; Tr. vol. III: 556-61, 565-66)

Late RFI responses, in some cases, required PKC to return to an interstitial space after the majority of installations in the space had been installed. Work in the now much more crowded interstitial spaces was substantially more difficult and less efficient. (Tr. vol. III: 560)

Contract design conflicts between the mechanical and the architectural design resulted in cast iron risers interfering with various architectural features. These conflicts disrupted PKC's piping installation because of tardy response to RFIs seeking the VA's directions regarding resolution of the conflicts. In many

cases, PKC had to relocate crews to other tasks and work areas pending receipt of RFI responses. (Exh. A-42; Tr. vol. II: 326-31, 435-40, 452-63; Tr. vol. III: 547-49, Tr. vol. IV: 678-73, 688-96)

As shown in the Contract, the medical gas system did not comply with applicable codes and conflicts existed on the Drawings between the medical gas system and architectural elements. The resulting RFIs and changes were not resolved until 1993, well after medical gas piping would ordinarily have been installed. Consequently, the medical gas piping had to be installed in a piecemeal manner. When resolution of the medical gas issues were finalized, PKC had roughed-in approximately half of the medical gas installation. Therefore, PKC had to re-work the medical gas system. Additional problems arising out of the medical gas changes were caused by the A/E's modification drawings being on 8½ x 11 sheets of paper, which created the need for additional coordination and installation effort. (R4, tab 27,884; Exh. A-42; Tr. vol. III: 554-56, 586-88, 596-98; Tr. vol. IV: 707-17; Tr. vol. VI: 1073-74)

The VA frequently changed the Government-furnished equipment to be installed by PKC from that specified in the Contract. This equipment included: radiology/x-ray equipment, laboratory equipment, sterilizers, scrubbers, hydrotherapy tubs, kitchen equipment and hoods, operating room equipment and other specialized items. These changes, and RFIs clarifying the changes, occurred throughout 1992, 1993 and 1994 and affected PKC's effort in the areas where this equipment was located, basement through fourth floor in the West, Central, and East Towers. (Exh. A-37-38, A-42; Tr. vol. I: 172-73; Tr. vol. III: 477-74, 563-65, 566-76, 550-88; Tr. vol. IV: 650-76, 715-16, 768-70)

Dental lab gas and vacuum systems conflicts engendered RFIs and prevented PKC from roughing-in the service boxes to serve the dental clinic in normal sequence until the RFIs were resolved. PKC had to return to dental clinic

areas to complete installation when the VA determined the location of the dental service boxes. Also, every kitchen equipment item on the first floor of the West Tower and the Basement of the Central tower had an RFI associated with it and none of the equipment could be installed according to the Contract drawings. In the Canteen area on the first floor of the West Wing, kitchen equipment was changed several times. A year after the work in the Canteen area was completed, PKC and USM had to return from the fifth floor of the East Wing to implement changes. (R4, tabs: 28,034, 28,052; Tr. vol. III: 556-76, 576-78; Tr. vol. IV: 761-70; Tr. vol. VI: 1051-53, 1072)

PKC's work in Hydrotherapy Rooms was disrupted by VA changes. Hydrotherapy tub rooms were located on lower floors and then two rooms per ward on the upper floors. After three rooms had been finished on lower floor West, VA totally changed the rooms requiring PKC to return to the rooms and move all rough-in work and drains after ceramic tile was in place. (Tr. vol. III: 577-582)

In many rooms of the Wet Laboratory areas in basement and first floor of the West Tower, PKC had to omit rough-in work, resulting in PKC's installations "hop-scotching" through the areas. PKC would install work in one room, but not the adjacent room. Later, PKC had to come back into the area to install work in the omitted rooms. (Tr. vol. III: 554-56; Tr. vol. IV: 652-53, 707-09, 770)

Storm drain risers in the West tower had conflicts with closets, showers and other architectural features. Until the conflicts were resolved, PKC could not install the riser on that floor, or on any of the floors above. (Tr. vol. IV: 728-29)

There were approximately 20 ice machines in the hospital, one at each nurse station. The Contract design omitted domestic water service, waste piping and electrical service. By the time the VA issued a change order to have PKC add domestic water and waste piping, the areas in the West Tower and on the

lower floors had already been roughed-in. This required PKC to pull a crew from another area to rough-in the ice machine piping. (Tr. vol. IV: 738-40)

Telecars ran through the interstitial space along a track. The telecar system was not shown on the mechanical drawings. The system was intended for transfer of specimens and materials throughout the hospital. Clearance within the interstitial space was required to accommodate the track, the car, the tray that sat on top of the car and a clear space above the tray to a height sufficient for the specimen jars. In several instances, the telecar system conflicted with pipe installations in the interstitial space. (Exh. A-42, Tr. vol. IV: 757-60)

Drains specified for the roofs and patios, as well as for air handler units in the mechanical rooms were not proper. The VA delayed in responding to PKC's inquiry regarding the drains, resulting in PKC ordering the proper drains unassembled or "bagged and tagged." This required PKC to expend labor to assemble and install the drains. There was a conflict in place regarding steam trap assemblies. The Contract drawings for the Energy Center detailed a particular steam trap; the drawings for the rest of the HVAC system did not detail the steam traps. In response to PKC's RFI seeking information on the non-Energy Center steam traps, the VA directed PKC to install all steam traps as detailed on the Energy Center drawings. PKC received an equitable adjustment for the extra cost of material and labor to install the steam traps. PKC was not paid for the costs of assembling the drains in the field as opposed to assembling the drains in its on-site prefabrication shop. By the time the VA provided its response to the RFI, the on-site prefabrication shop had been torn down. (R4, tab 28,050; Tr. vol. III: 467; Tr. vol. IV: 717-21, 732-38)

During the coordination drawing process, PKC submitted numerous RFIs where piping shown on the contract drawings could not be installed due to structural obstructions (pre-cast beams and joists). This was particularly a

problem on the lower floors of West, Central, and East Towers. PKC could make minor adjustments to pipe location in the interstitial spaces if the piping remained in the designated zone. If piping had to be moved from an interstitial zone, VA approval was required. In several instances, PKC could not easily relocate the pipe, even with the VA's approval, because it was a gravity drain system. In order to maintain gravity flow, PKC had to lower the main as well as the branch piping. VA responses when notified of these conflicts sometimes took months, requiring PKC crews to skip the affected areas and move to other places, only to have to return to the areas to complete the piping systems. Amendment One to the IFB modified the end of Paragraph 3.1 of Specification Section 15840, "Ductwork and Accessories" to include the following language: "Provide offsets as required to avoid conflicts." (R4, tabs 69, 500-05, 27,518; Exh. A-42; Tr. vol. II: 452-57; Tr. vol. III: 528; Tr. vol. IV: 631-32, 688-707)

The identity of boiler and incinerator exhaust piping was transposed in various sections of the Contract drawings. The two pipes were different size and boiler exhaust piping was relatively lightweight while incinerator exhaust was relatively heavy; thus, the location of each pipe was important because the method of supporting the piping as it went up through the building differed for each type of exhaust. The VA did not definitively respond to what was tabbed as the "boiler breaching" RFI for approximately two years. Although the sections of drawings transposed the labeling of the exhaust pipe, the size could be discerned and the right location could have been discerned from the drawings. The pipe installation was performed without problem after some required changes relating to stairwell and chase construction were resolved.
(R4, tab 27,555; Tr. vol. III: 351-53, 591-92, 600-01; Tr . vol. VI: 949-51, 1032-34)

PKC compared the actual count of cast iron fittings installed in the interstitial spaces of the first floor of the Center Tower and seventh floor of the

East Tower to the number of fittings shown on the Contract Drawings for those locations. Extrapolating from this analysis, PKC estimates that it installed 39% more "change of direction" cast iron pipe fittings than shown on the Contract drawings throughout VAMC West Palm. (R4, tab 28,012; Exh. A-36; Tr. vol. IV: 771-81)

PKC's work force at the site averaged approximately fifty during 1992 and 1993. (R4, tab 28,012; Tr. vol. IV: 658)

Mr. MacClugage testified that PKC would normally expect to complete its installation in two "passes" through an area, the first pass was the rough-in phase and would include 95% of the required work and the second pass would be a finish phase. According to Mr. MacClugage, PKC was able to complete only two thirds of the work in its initial pass through an area at VAMC West Palm and that three to four additional passes were required to finish an area because of the RFI and change problems. (Tr. vol. IV: 671, 702, 768-70; Tr. vol. V: 862)

CONTRACT ADMINISTRATION

Included in each executed Supplemental Agreement (COSA or FSA) modifying the Contract, was the following language:

> F. This supplemental agreement constitutes full and complete compensation due the contractor for all costs, direct and indirect, resulting from the modification set forth herein with exception of the Reservation set forth below:
>
> Exception
>
> We, The George Hyman Construction Company, General Contractor, expressly reserve the right to claim for disallowed processing costs and compensation, time or both arising from the impact of this change, alone or

> in combination with other changes, on unchanged work, or in other changes.
>
> The above reservation shall serve only to preserve the Contractor's right to submit claims as specified. It shall not be construed to constitute evidence of an agreement between the Contractor and the Government as to the meaning of "impact" or the allowability of any claims, nor shall it be considered in any manner to constitute a waiver of the limitations on overhead, profit, and/or fee otherwise applicable to the Contractor and subcontractors at any time through the provisions of this Contract.

(R4, tab 495)

The purpose of this language was to reserve Clark's claims for constructive changes and impacts from labor disruption and inefficiencies. (Tr. vol. I: 232; Tr. vol. II: 333-36; Tr. vol. IV: 736-37)

The VA refused to pay equitable adjustments for additional coordination drawing efforts, alleging that any disruption and piecemeal performance of coordination drawings fell within Clark's "contractor coordination" responsibilities. Similarly, the VA rejected most requests for equitable adjustments for the labor and material costs of rerouting USM and PKC installations around structural members and other disruption labor costs for the same reason. (Tr. vol. I: 180-83; Tr. vol. IV: 735-37)

Except for COSA I-K (Acceleration of Plumbing Fixtures and Trim Out for Early Occupancy of West Tower Office Space in late 1993 and early 1994) and COSA I-L (Acceleration of Plumbing Fixtures, Trim Out and Balancing for East Tower Early Occupancy in late 1994 and early 1995), no change order compensated PKC or USM for disruption, inefficiency or impact costs to the base contract work for the effects of any change. The VA and PKC met to discuss change order pricing methodology in early 1992. In the meeting, it was agreed

that PKC would use the Mechanical Contractors Association of America (MCAA) Bulletin 58 as the estimating manual to establish the unit labor for the extra work. USM utilized a different estimating guide in pricing extra work and its prices were based solely on the per pound installation costs of its additional work. The VA stated that PKC would only be paid for the cost of the changed work itself, and that impact costs would not be paid. As a result, Clark included a reservation of rights in every bilateral change order. (Exh. J-1; Tr. vol. I: 83, 85; Tr. vol. IV: 735-37)

PKC used MCAA Bulletin No. 58 to estimate the effects and impact of the acceleration that was part of COSAs I-K and I-L. The MCAA factors were the basis of the negotiated amounts for labor productivity losses for fixture installation, trim out, and balancing mechanical activities in the areas accelerated for COSAs I-K and I-L. (Exh. J-1; Tr. vol. I: 174-76, 232; Tr. vol. IV: 735-37)

The VA has not questioned the overall quality or efficiency of PKC's and USM's performance. PKC and USM performed in a competent and reasonable manner and complaints of the quality, timeliness of their work or the skill of their workforces were minimal. (Tr. vol. V: 887)

Included as part of claims submitted by Clark to the VA totaling $10,027,812 in November 1995 and May 1996 and denied by the VA, were PKC's and USM's claims for equitable adjustment totaling $916,958. The Board, in ***Clark Construction Group, Inc.***, VABCA Nos. 5673 ***et. al.***, 99-1 BCA ¶ 30,128, held that PKC (including USM) claims for labor inefficiency were included in Clark's November 1995 and May 1996 claims. At the request of the parties, the Board, on November 4, 1998, redocketed the appeals relating to the Contract. The instant appeal (VABCA-5674), denoted as "Poole & Kent Inefficiency", was one of those redocketed appeals. All the appeals relating to the Contract, save

this appeal, were ultimately settled by the parties. Clark further definitized the PKC/USM inefficiency claim in the amount of $1,764,000 in July 1998. (R4, tabs 27,965-97)

Quantum

INTRODUCTION

The PKC claim for labor inefficiency is based on analyses prepared by Mr. MacClugage, PKC's project manager who arrived on site in January 1992 and PKC's expert, Mr. Stynchcomb, of the causes and quantity of the labor hour overrun on the project and the PKC's and USM's excess costs of preparing the project coordination drawings. Mr. Stynchcomb utilizes information developed or provided by Mr. MacClugage, PKC's project manager for PKC's claims and Mr. Tammaro, USM's senior project manager for USM's claims in his analyses to arrive at the amounts attributable to the VA caused labor productivity losses.

Mr. Stynchcomb utilizes three separate methodologies: Measured Mile Analysis; MCAA Method; and, Modified Total Cost Analysis to arrive at the amounts for which the VA is allegedly liable. Mr. MacClugage performed Measured Mile and MCAA analyses to arrive at his determination of PKC's productivity losses. The VA's experts, Ms. Sisk and Mr. Lowe contest Mr. Stynchcomb's assessments. These Findings of Fact pertaining to quantum will deal with the specific issues and elements relevant to a quantum determination.

PKC BID

PKC's proposal to Clark was 1.5% more than the low proposal and 2.5% less than the third low proposal. Based on the fact that the other two proposers were two of the largest and most experienced (other than PKC) mechanical

contractors on the East Coast, his personal knowledge of one of the other proposer's bidding procedures and techniques and the fact that PKC did not experience an overrun of its estimate for materials, Mr. Stynchcomb determined that the PKC bid to Clark, including amounts included for the work of USM, was reasonable. The VA has not contested the reasonableness of PKC's bid. (Exh. A-19; Tr. vol. I: 39; Tr. vol. IV: 886-87)

LABOR RATES

At the hearing the parties stipulated to the following hourly labor rates:

PKC Productive Labor	$19.47
PKC Foreman	23.09
USM Mechanic	25.78
USM Foreman	32.65

(Tr. vol. IV: 810-13)

PKC incurred foreman labor at a rate of 17% of craft labor in the VAMC West Palm project; therefore, PKC's composite hourly labor rate for the project is $20.08. USM's composite hourly labor rate is $26.46 based on a rate of supervision to craft labor of 10%. (R4, tab 20,814)

INCURRED LABOR

PKC expended a total of 286,632 hours of direct labor, including change orders and supervision, to complete its work. PKC estimates its change order labor hour total as 19,850, a figure uncontested by the VA. Thus, PKC expended 266,782 labor hours to complete base Contract work at VAMC West Palm. Originally estimating that 181,974 labor hours would be required, PKC expended 84,808 labor hours more than anticipated to complete its base Contract work. PKC estimated that it would incur 91,000 hours of labor in the period of July 1991

to November 1992, the period during which exterior site conditions were affected by the Stop Pump Orders. (R4, tab 28,012, 28,014; Exhs. A-43, J-1; Tr. vol. IV: 696-798, 802-6)

USM estimated that a total of 53,004 labor hours would be required for the work at VAMC West Palm. USM expended a total of 69,053 labor hours for the project. Of that total, 3,233 hours were incurred for change order work. This results in USM overrunning its base Contract labor hour bid estimate by 12,816 labor hours. This results in a combined PKC/USM labor hour overrun of 97,624 labor hours for completion of base Contract work at VAMC West Palm. (R4, tabs 265, 28,015-16, 28,018, 28,021; Tr. vol. I: 142; Tr. vol. II: 265)

MEASURED MILE ANALYSIS

A measured mile analysis compares work performed in one period not impacted by events causing a loss of productivity with the same or comparable work performed in another period that was impacted by productivity affecting events. PKC's measured mile analysis was accomplished by the collaboration of Mr. MacClugage and Mr. Stynchcomb. The analysis applies only to the PKC portion of the claim. Mr. MacClugage, under the direction of Mr. Stychcomb, evaluated the original contract drawings and PKC's labor reports to establish the lineal feet of different piping installed and the man-hours necessary for the installation (*i.e.* the productivity rate). The actual lineal feet of piping was determined by PKC personnel doing detailed take-offs from the Contract drawings and providing that information to Mr. MacClugage. The analysis compares productivity rates for installation of four piping systems (domestic water, interstitial heating hot water, medical gas and cast iron drain, waste and vent) on the first floor with the installation productivity rates for sixth or seventh floors of the main hospital structure. The productivity rates are expressed in the

number of feet of the various piping installed per man-day. PKC also compared the underground piping work for the hospital with the underground work for the nursing home which was adjacent to VAMC West Palm. Clark was awarded a separate contract for construction of the nursing home in 1993 and PKC was also the mechanical subcontractor for that project. The underslab utility work for the nursing home was similar to (although less complicated or extensive than) the work on VAMC West Palm. The nursing home underslab work was performed according to plan since site de-watering problems had been resolved by the time the construction took place and the nursing home site was at a substantially higher elevation than the VAMC West Palm site. The first, sixth and seventh floors were chosen because installations on the first floor were accomplished in a period allegedly substantially affected by water and RFIs while the sixth and seventh floor installations were relatively unaffected by water or RFIs. The underground piping analysis compared productivity rates for installation of such work at VAMC West Palm with rates for installation of underground piping in the nursing home built adjacent to VAMC West Palm, a project separate from VAMC West Palm. This comparison was made because the nursing home underground piping installation was not impacted by de-watering problems and the nursing home was immediately adjacent to the main hospital building. Overall, however, there was no unimpacted area or time on the project to establish a baseline for the measured mile analysis; therefore, PKC used a lesser-impacted area (sixth and seventh floors) as the baseline. (R4, tab 28,012; Exh. J-1: Tr. vol. IV: 781-785, 791-94; Tr. vol. V: 835-86, 869-71; Tr. vol. VII: 1104-05, 1162)

PKC selected the first and seventh floors for its measured mile analysis because, in Mr. MacClugage's assessment, the first floor is representative of the relatively heavily impacted basement through fifth floor portion of the project

and the seventh floor is representative of the relatively unimpacted sixth through ninth floor portion. For one piping system analyzed (heating hot water), Mr. MacClugage compared the first and sixth floors because he found that PKC had improperly coded its seventh floor work which prevented him from determining the number of manhours actually expended to install the heating hot water system on that floor. Mr. MacClugage also "adjusted" the first floor actual man-day per lineal foot rates. The adjustment was made because the installations on the first floor involved more and larger pipe and fittings and the adjustment was necessary, in Mr. MacClugage's view, for accurate comparision of productivity rates between the floors. The record contains neither Mr. MacClugage's adjustment methodology or calculations. Mr. MacClugage determined a percentage inefficiency factor for the first floor installations dividing the difference of the lineal feet/man-day productivity rate between the first and sixth or seventh floor by the sixth or seventh floor productivity rate. The underslab utility inefficiency factor was determined by applying the same methodology as that used for arriving at the inefficiency factor in the main hospital and comparing main hospital underground productivity rates to the rates for the Nursing Home Rate. Adjustments to the nursing home productivity rate were made in reaching the underground piping inefficiency factor. Mr. MacClugage's analysis yields the following results:

SYSTEM	INEFFICIENCY FACTOR
DOMESTIC WATER	28%
INTERSTITIAL HEATING HOT WATER	53%
MEDICAL GAS	27%
CAST IRON	20%
UNDERGROUND PIPING	25%

(R4, tab 28,012; Tr. vol. IV: 783, 792, Tr. vol. V: 836-37, 860-61)

Mr. Stynchcomb utilized the MacClugage analysis to extrapolate an overall estimated productivity loss of 44,500 manhours for VAMC West Palm. The manner in which he arrived at this figure is best explained by his testimony:

> Q When you did the measured mile analysis, did you do it for how many systems, approximately how many systems?
>
> A We did it for the storm sanitary waste and vent system, medical gas, domestic water and heating hot water and the underground systems.
>
> Q And what was your conclusions utilizing the measured mile analysis between the very bad versus, I guess, the bad?
>
> A The bad, yeah, it's the very bad versus the bad, not the very bad versus the plan or the reasonable estimate. That overall if you look at the overall systems, it would appear that Poole and Kent lost about a third. My opinion would be that they lost a third of their productivity between the worst areas and the less impacted areas. As a general number that I think is a fair and reasonable approximation of the loss.
>
> Q Knowing that you're an exact person, which drives me nuts, okay? What was the exact --
>
> A Thirty-two percent, Mr. Braude. Not 33 percent.
>
> Q All right. When you did the initial measured mile analysis in your expert report, you only did it with regard to certain systems, correct?
>
> A That's right.
>
> Q What systems, if any, should you have included in addition that you certainly learned of during the hearing?
>
> A Well, in my measured mile I took system by system so I could compare the exact system on the lower floor with the exact system on the upper floor. There were other systems that suffered significant losses. And the only reason why I did not include those in my first analysis, was because they were not broken out by floor. And those were the significant hours and the hangers, material handling, the water PRV stations and other areas where Poole and Kent suffered labor losses but were not divided by floor. And so I didn't

exclude those intentionally, I simply looked at an indicator to try to get an indicator of Poole and Kent's overall loss.

Q If you take into consideration the hangers and the material handling and these other miscellaneous systems that the evidence, at least Poole and Kent's and United's evidence say was impacted. With regard to Poole and Kent's labor, what would you conclude?

A If you include those other systems, which were part of the loss, you'd get to about 44,500 hours.

Q And how would you do that?

A You'd simply add in the hours for the floor areas. You simply take the labor report hours by the categories of those systems, which were not included in my analysis to get to the 32 percent, the one-third, into the total hour number which would increase the hours of loss and you would move to, as I said, approximately 44,500 to 45,000 hours of loss.

Mr. Stynchcomb concluded that the systems and the floors included in Mr. MacClugage's Measured Mile Analysis presents a "representative slice" of VAMC West Palm and that it is valid to apply the analysis to ascertain an overall project loss of productivity. At PKC's combined hourly labor rate of $20.08, PKC values its productivity loss derived by use of the measured mile analysis at approximately $893,560 plus applicable mark-ups. (R4, tab 20,812; Tr. vol. V: 871, 876-78)

Ms. Sisk, the Government's expert took exception to the validity of PKC's measured mile analysis on the basis that the lower floor (and nursing home) work could not be compared to the upper floor (and main hospital underground pipe) work for the purpose of a measured mile analysis. She opined that the attempt to reconcile this difference by use of "adjustments" was contrary to recognized measured mile analysis methodology and that the use of adjustments, in and of themselves, indicated the inappropriateness of the use of a measured mile approach to determine loss of productivity rates in this instance.

Ms. Sisk indicated that there was no "unimpacted" period or area of the project that would permit the establishment of a measured mile baseline for comparison, a circumstance in which Mr. Stynchcomb concurs. Ms. Sisk also pointed out that Mr. MacClugage's use of average estimated productivity rates for a particular piping system where there were wide differences indicated for various parts of each floor would not provide an accurate result because of the variance in planned productivity rates for the same work. Finally, Ms. Sisk found that the acknowledged coding errors brought into question the validity of the analysis since accurate reporting by PKC of the actual expended labor hours was essential for a valid report. (R4, tab 28,012; Tr. vol. V: 878-89; Tr. vol. VII: 1153-63)

MCAA ANALYSIS

Mr. MacClugage, with some direction and supervision by Mr. Stynchcomb, performed an analysis intended to quantify the number of craft labor hours of productivity loss using productivity factors published by the Mechanical Contractors Association of America, Inc. (MCAA). Mr. MacClugage used his personal knowledge of job site conditions obtained as PKC's project manager. Specifically, he applied three of the productivity factors listed in Section PD-2, "Productivity" of the 1994 MCAA manual entitled "Change Orders – Overtime – Productivity" (MCAA Manual) for the years 1992-94 in an attempt to determine the number of hours of its productivity loss in those years. Mr. MacClugage used the years 1992-94 because those are the years, in his view, PKC's labor productivity was primarily affected by VA caused factors. Mr. Stynchcomb reviewed Mr. MacClugage's analysis and performed his own MCAA analysis to quantify PKC's number of hours of lost productivity. Mr Stynchcomb performed a similar analysis for USM's productivity losses. (R4, tabs 28,012-13; Exh. A-45, Tr. vol. IV: 629, 785, 813-14; Tr. vol. V: 878-80)

Mr. John R. Gentille, MCAA Executive Vice President, states that the productivity factors contained in the MCAA Manual were developed by MCAA's Management Methods Committee but are not based on any empirical study determining the specific factors or the percentages of loss associated with the individual factors. Mr. Gentille stated that these factors are intended to be used in conjunction with the experience of the particular contractor seeking to use them because percentage of increased costs could well vary from contractor to contractor, crew to crew and job to job. The MCAA factors are widely used in the industry for estimating and productivity valuation purposes. In assessing productivity loss, the MCAA factors are generally used as a guideline as interpreted by experienced project personnel familiar with the specific circumstances of a particular job and contractor. (R4, tabs 27,964, 20813; Tr. vol. V: 881-82)

The MCAA Manual identifies sixteen productivity factors and includes a narrative description of each factor. For each factor, the Manual assigns a percentage productivity loss for three condition categories (minor, average, severe). PKC applied three of the productivity factors: Morale and Attitude; Reassignment of Manpower; and, Dilution of Supervision in developing the number of manhours of lost productivity it experienced. The Manual's description and loss percentages for those factors are:

	Condition and Percentage		
Factor	Minor	Average	Severe
Morale and Attitude: excessive hazard, competition for overtime, over-inspection, multiple contract changes and rework, disruption of	5%	15%	30%

labor rhythm and scheduling, poor site conditions, etc.			
Reassignment of Manpower: Loss occurs with move-on, move-off men because of unexpected changes, excessive changes, or demand made to expedite or reschedule completion of certain work phases, preparation not possible for orderly change.	5%	10%	15%
Dilution of Supervision: Applies to both basic contract and proposed change. Supervision must be diverted to (a) analyze and plan change, (b) stop and replan affected work, (c) take off, order and expedite material and equipment, (d) incorporate change into schedule, (e) instruct foremen and journeyman, (f) supervise work in progress, and (g) revise punch lists, testing, and start-up requirements.	10%	15%	25%

(R4, tab 28,012-13; Exh. A-45; Tr. vol. IV: 814-21)

The MCAA Manual states, in the Section PD 2 prologue:

> We have all been aware of a need for discussion of the adverse effects on labor productivity resulting from causes beyond the direct control of the mechanical contractor.

> A study of these productivity factors may be helpful in preparing original estimates and change orders. In fact, introduction of a given factor or job condition producing a degree of effect on productivity may well trigger a change order.
>
> The individual items and titles proposed, cover a description of conditions without necessarily including each detailed condition that may be involved. The values are a percentage to add on to labor costs for change orders and/or original contract hours.
>
> These factors listed are intended to serve as a reference only. Individual cases could prove to be too high or too low. The factors should be tested by your own experience and modified accordingly in your own use of them, since percentages of increased costs due to the factors listed may vary from contractor to contractor, crew to crew and job to job.

(R4, tab 20,813)

Mr. MacClugage, utilizing PKC's certified payrolls and weekly cost records, calculated PKC labor expenditures by month and year for the 1992 through 1994 period. Mr. MacClugage also estimated the number of labor hours attributable to change order work for each year and subtracted the change order labor amounts from the total incurred labor amount to arrive at the base contract amount. The base contract amount is the number of labor hours PKC incurred to perform the unchanged Contract work. The base contract labor hours so computed by Mr. MacClugage are:

Year	Number of Labor Hours
1992	92,838
1993	75,234
1994	56,474

(Exh. A-45; Tr. vol. IV: 815-16)

Mr. MacClugage assigned an MCAA "Average" effect on labor efficiency of 15% on PKC's workforce morale and attitude for 1992. In Mr. MacClugage's judgment, the wet conditions at the site, and the constant crew relocations and material availability problems occasioned by the RFI problems and construction sequence caused low crew morale and attitude problems. Similarly, Mr. MacClugage assigned an "Average" 10% effect on efficiency due to Reassignment of Manpower due primarily to piecemeal work caused by having to wait for RFI answers. Finally, Mr. MacClugage assigned a "Minor" effect of 10% resulting from the dilution of PKC supervision in 1992. The dilution of supervision resulted from the time PKC supervision had to devote to coordination drawing preparation, the fact that crews being supervised were on multiple floors, and the logistics problems resulting from the construction sequence change. Overall, Mr. MacClugage, applying the MCAA factors, finds an impact of 35% on PKC labor during 1992. Dividing the 92,838 hours PKC incurred to complete base contract work by 1.35 and subtracting the 68,769 thus derived from 92,838, Mr. MacClugage determined that 24,069 of those hours were unproductive due to VA caused inefficiency. (Exh. A-45; Tr. vol. IV: 816-20, 822-23)

The manner in which Mr. MacClugage calculated the MCAA loss of productivity was determined by Mr. Stynchcomb who explains the calculation thusly:

> Q With the factors, themselves?
> A The factors, themselves don't change, it is the correct application of the factors in both a prospect [ive] and a retroactive analysis of productivity loss.
> Q If I can, briefly, could you just tell us quickly how you do it prospectively and how you do it retroactively --
> A Well, the factors --

Q -- just for the record.
A Right. The factors were originally designed to be applied prospectively against estimated hours; however, there are many cases where that's simply not applicable. For instance, in actual cases, many jobs are delayed and also suffer a loss of productivity as is the case with this job. It's impossible to spread the estimated hours over the total duration of the project because you simply run out of the original duration in many cases. It also can inaccurately forecast the impacts of delays. What I have found in looking at a lot of cases that have been submitted, claims have been submitted, is the contractor also, in my opinion, incorrectly multiplies the MCAA factors times the actual hours expended. Well, those actual hours already include the loss or productivity. In my opinion, that's double dipping. I explain in the new draft manual of why that's wrong and how to correctly apply the percentages to account for productive hours and subtracting those productive hours from the total actually, you come up with a much more reasonable, and, frankly, a conservative estimate of loss.
Q And how do you do that, just quickly?
A Well, rather than multiplying the aggregate percentages times the total loss of actual hours, you divide the actual hours by one point of the percentage, that equates to the productive hours. In other words, at a 25 percent loss how many hours would have been productive given a certain actual hour number? Then you come up with a productive hour total. You subtract that from the actual hours and that equates to your loss or productivity. That was actually pointed out in the Trauner report evaluating our report as being an error which we did not commit and Trauner was certainly aware of the opportunity to commit that error in doing an MCAA analysis.
Q But if you -- if, like 1K, if you do it prospectively, you would just take your estimated hours and multiply it by a --
A Will you look at 1K and 1L? The MCAA factors were applied prospectively to evaluate the impacts of those two changes to the production of Poole & Kent. Those factors were used in the negotiation, as I understand it, were used in the negotiation of those two.

Q But I'm asking for the appropriate formula.
A In the case of a prospected formula you would simply apply the factors to the estimated hours, which is what was done.
Q So it's estimated times the factor?
A Right.

For 1993, Mr. MacClugage applied the same three MCAA productivity factors. He applied the same percentage effect he used for 1992 for the MCAA Reassignment of Manpower and Dilution of Supervision productivity factors. However, he reduced the effect of the Morale and Attitude productivity factor to a "Minor" impact of 5% due to the fact that the coordination drawing problems affecting PKC's labor were essentially over by 1993. Thus, Mr. MacClugage determined that PKC experienced an overall impact on its productivity of 25% in 1993. This translates to 15,047 unproductive hours in that year. Mr. MacClugage reduced the total MCAA inefficiency percentage to 15% for 1994, eliminating the Morale and Attitude factor and reducing the Reassignment of Manpower productivity factors to a "Minor" impact of 5%. Morale was no longer an inefficiency factor because, by 1994, VAMC West Palm was dry and the only thing affecting manpower reassignment were the continuing RFI problems. The Dilution of Supervision factor was maintained at 10% over all three years because of the vertical construction sequencing. Mr. MacClugage calculated that 7,366 of the 56,474 labor hours PKC incurred to perform base contract work in 1994 were unproductive. Thus, based on his MCAA anlysis, Mr. MacClugage estimates that PKC lost 46,482 labor hours in constructing VAMC West Palm due to VA caused inefficiency. At the $20.08 composite hourly labor rate, Mr. MacClugage's analysis places PKC's inefficiency losses, calculated using the MCAA factors, at $937,375. (Exh. A-45; Tr. vol. IV: 821-24)

Mr. Stynchcomb's MCAA analysis for PKC identified two of the MCAA Productivity factors, Reassignment of Manpower (10%) and Dilution of Supervision (15%) as affecting PKC's work for the entire construction period. Mr. Stynchcomb based his analysis on a review of the project files and discussions with Mr. MacClugage. Thus, using the PKC total of 266,782 hours of labor to perform base Contract work, the total number of hours of PKC unproductive labor hours attributed to the VA by Mr. Stynchcomb using his MCAA analysis was 53,356 resulting in a monetary claim of $1,071,388. Mr. Stynchcomb indicated, however, that Mr. MacClugage's analysis may be more accurate since it was based on Mr. MacClugage's experience on the job and knowledge of actual conditions. (R4, tabs 20,812-13; Tr. vol. V: 879-80)

Mr. Stynchcomb, reviewing USM project records and interviewing USM project personnel, performed an MCAA analysis of USM labor productivity. Mr. Stychcomb calculated the base Contract work labor incurred by USM by month from January 1992 through December 1994. He then assigned MCAA productivity factors to each month. The two MCAA factors utilized by Mr. Stynchcomb were:

	Condition and Percentage		
Factor	Minor	Average	Severe
Concurrent Operations: Stacking of this contractor's own force. Effect of adding operation to already planned sequence of operations. Unless gradual and controlled implementation of additional operations made, factor will apply to all remaining and	5%	15%	25%

proposed contract hours.			
Errors and Omissions: Increases in errors and omissions because changes usually performed on crash basis, out of sequence or cause dilution of supervision or other negative factors	1%	3%	6%

From January 1992 through December 1993, Mr. Stynchcomb ascribed a percentage factor of 10% for Concurrent Operations for each month; thereafter, he ascribed no impact on USM's productivity due to Concurrent Operations. Except for the period January-June 1992, Mr. Stynchcomb ascribed the Errors and Omissions impact as "severe"; the impact for January 1992 was "minor and February-June 1992, "average." Making the appropriate calculations for each month, Mr. Stynchcomb arrived at a total number of unproductive hours for USM at 7,065. At the USM composite labor rate of $26.46, the value of USM's asserted lost productivity would be $186,940. In his written report, however, Mr. Stynchcomb estimated 7,400 hours of lost productivity for USM based on an MCAA analysis. (R4, tabs 28,012-13, 28,015-17, 28,021-22; Exhs. A-37, 38)

Performing yet another MCAA analysis in its Brief, PKC finds a productivity loss of 11,149 man-hours for USM stating:

> In order to quantify United Sheet Metal's loss of productivity, the MCAA analysis performed by Mr. MacClugage for Poole and Kent can be equally applied to United Sheet Metal. Although Mr. Tammaro did not perform a MCAA analysis in the same manner as Mr. MacClugage, Mr. Tammaro testified that United Sheet Metal encountered the same problems as Poole and Kent in 1992. Thus, the MCAA factors for reassignment of manpower at a 10% average loss

factor, morale and attitude at a 15% average loss factor, and dilution of supervision at a 10% minor loss factor should be applied to United Sheet Metal's actual man-hours to measure the loss of productivity encountered by United Sheet Metal. In addition to the factors used by Mr. MacClugage for Poole and Kent, a loss of productivity for logistics, based upon Mr. Tammaro's testimony regarding the problems with material handling, requires the application of a 10% minor loss factor.

The total MCAA loss of labor factors employed for United Sheet Metal in 1992 is 45%. Thus, applying that factor to USM's field labor for 1992 of 28,365 man-hours results in a loss of labor productivity attributable to the Government of 8,803 man-hours in 1992.

Mr. Tammaro testified that the loss of productivity was not as severe for 1993 and 1994. Because the site utilities were installed throughout 1993, the site conditions gradually improved, thus reducing the impact on United Sheet Metal's material handling costs. In addition, United Sheet Metal's problems regarding certain of the RFIs were minimized. However, the VA began issuing change orders to finally resolve these RFIs, thus affecting United Sheet Metal's productivity on its base contract work. Thus, for 1993, a 5% minor loss factor for reassignment of manpower and a 6% loss factor for errors and omissions is required. The total MCAA loss of labor factors employed for United Sheet Metal in 1993 is 11%. Thus, applying that factor to USM's field labor for 1993 of 20,380 man-hours results in a loss of labor productivity attributable to the Government of 1852 man-hours in 1993.

Mr. Tammaro testified that the bulk of USM's inefficiencies occurred in 1992 and 1993. Thus a 5% minor loss factor for reassignment of manpower applied to USM's field labor for 1994 of 10375 man-hours results in a loss of labor productivity attributable to the Government of 494 man-hours in 1994.

Thus based upon an application of the MCAA loss of productivity factors to United Sheet Metal's field labor for the years 1992-1994, United Sheet Metal lost 11,149 man-hours due to VA causes.

This analysis leads to quantification of USM's lost productivity in the amount of $295,003. (MAIN at 107-09)

Mr. Lowe, the VA's expert, questioned the utility of the MCAA Manual for quantifying the loss of productivity retrospectively. He based his opinion on the ambiguity of the MCAA factors and the ambiguous instructions in the MCAA Manual as to how the factors are to be applied. Mr. Lowe has previously indicated, however, that use of MCAA factors for quantifying loss of efficiency claims may be appropriate if a proper measured mile analysis is not possible. (R4, tab 28,026; Tr. vol. VIII: 1107-11)

MODIFIED TOTAL COST

Mr. Stynchcomb also performed a "modified total cost" analysis for the purpose of establishing the amount of PKC's and USM's lost productivity attributable to the VA. In his analysis, Mr. Stynchcomb reviewed the reasonableness of PKC's bid, PKC's and USM's record keeping, the quality of PKC's and USM's performance including the reasonableness of the labor costs incurred, and the impact of the various circumstances affecting productivity during the course of the project. This review included the project records, interviews of PKC and USM personnel, testimony of VA personnel and witnesses in deposition and other discovery material submitted by the VA and the testimony in the instant hearing. (R4, tab 28,012; Tr. vol. V: 886-88)

Mr. Stynchcomb opined that PKC's bid was reasonable based on PKC's and USM's status as large mechanical and HVAC subcontractors and the fact that PKC's bid was within 3% of the other proposers on the project. Drawing on his experience both as an employee of a large mechanical contractor charged with productivity analysis and as a consultant on productivity, Mr. Stynchcomb concludes that PKC's and USM's record keeping on the project relating to labor

productivity was better than the industry standard and that there is no practical way to create or maintain records to track labor productivity by a specific cause. Mr. Stynchcomb found PKC's and USM's performance and actual incurred labor hours to be reasonable, a conclusion based in large part on the VA's consistent expression of its satisfaction with PKC's performance throughout the project. Mr. Stynchcomb evaluated the circumstances affecting labor productivity during the project and estimated that one third of the PKC/USM labor overrun was due to the actions of Clark and other non-VA caused factors. The non-VA factors affecting productivity considered by Mr. Stynchcomb in making his allocation were: 1) Clark's failure to create a project schedule with proper logic and to use the schedule for progression of the job; 2) Late window and exterior wall installation and "drying-in" of the building; 3) Late layout and coordination by Clark and its subcontractors; 4) Late installation of stairs by Clark; and, 5) Clark's late roofing submittal and installation. Although he did not quantify how he arrived at his percentages, Mr. Stynchcomb assesses that PKC is entitled to recover for 66% of its 84,808 man-hours of labor overrun (55,973 man-hours) and USM, using the same allocation, is entitled to recover for 8,439 of its total 12,786 man-hour overrun. Using the composite labor rates, PKC would thus be entitled to $1,123,938 for its unproductive labor and USM would be entitled to $223,296. (R4, tab 28,012, Exh. A-43; Tr. vol. V: 882-909)

USM TRUCKING COSTS

The costs incurred by USM for the additional labor required for the loading and unloading and additional handling of its prefabricated duct because of the wet site conditions are not included as part of the inefficiency claims. Those additional costs, not challenged by the VA are $10,000. (MAIN at 103,107)

COORDINATION DRAWINGS

PKC planned to utilize two or three "in-house" draftsmen to prepare its coordination drawings. Estimating that 400 such drawings would be required at an average cost of $200 per drawing, PKC anticipated the cost of its coordination drawing effort would be $80,000, a reasonable estimation. However, PKC expended $201,625 for the services of an outside drafting company retained between November 20, 1991 and April 29, 1992 that it determined was required to keep the coordination drawing effort on track when the construction sequencing changed. Since most Contract changes were initiated subsequent to April 29, 1992, the claimed additional costs are not related to coordination drawing preparation related to Contract changes. Thus, PKC expenditures for base Contract coordination drawing preparation were $121,625 in excess of those anticipated. PKC claims 5% mark-ups for itself and Clark, making the total coordination drawing claim as follows:

Excess Coordination Drawing Costs:	$121,625.00
PKC Mark-up @ 5%:	6,081.25
Subtotal	127,706.25
Clark Mark-up @ 5%	6,385.31
Total	134,091.56

(R4, tab 28,024; Exh. A-44; Tr. vol. I: 47, 51, 67-68; Tr. vol. IV: 806-10)

USM estimated it would cost approximately $99,000 to produce its coordinated drawings. In addition, USM received additional compensation related to Contract changes for drawing preparation in the amount of $18,210. However, USM incurred total costs of $269,045 for the production of base Contract coordinated drawings, resulting in a difference of $151,835. The total

USM coordination drawing claim is:

Excess Coordination Drawing Costs:	$151,835.00
USM Overhead @ 20%:	24,325.00
Subtotal	176,150.00
USM Profit @10%	17,615.00
USM Price	193,765.00
PKC Mark-up @ 5%	9,688.25
Subtotal	203,453.25
Clark Mark-up @ 5%	10,172.66
Total	213,625.91

(R4, tab 20816; Tr. vol. I: 81-2, 86-7; Tr. vol. II: 263-64)

The VA refused to reimburse any additional costs for base Contract coordination drawing effort. The VA asserted that it was not liable for any additional coordination drawing effort because the effort fell within the scope of Clark's "contractor coordination" responsibilities. (Tr. vol. I: 180)

PKC CLAIM

As presented in its Brief, PKC requests an equitable adjustment of the Contract in the amount of $1,935,092. This claim amount represents PKC's suggested "jury verdict" arrived at by averaging the labor overruns attributable to VA developed by Mr. Stynchcomb and Mr. MacClugage using the three different methodologies to which are added additional coordination drawing costs and various standard mark-ups. The claim is broken down as follows:

United Sheet Metal:	
USM Loss of Productivity:	$258,368
USM Additional Trucking Costs:	10,000
USM Additional Coordination Effort:	151,835
Subtotal	420,203
USM Overhead @ 20%:	84,041
Subtotal	504,244
USM Markup @ 5%:	25,212

United Sheet Metal (cont.)	
Subtotal	529,456
P&K Markup @ 5%:	26,473
Subtotal	555,929
Clark Markup @ 5%:	27,796
Subtotal	583,725
Poole & Kent:	
P&K Loss of Productivity:	$1,094,581
P&K Additional Coordination Effort:	121,625
Subtotal	1,226,206
P&K Markup @ 5%:	60,810
Subtotal	1,287,016
Clark markup @ 5%:	64,351
Subtotal	1,351,367
TOTAL EQUITABLE ADJUSTMENT REQUEST:	$1,935,092

(MAIN at pp. 133-35)

DISCUSSION

Once again, we address Government liability and the extent of that liability for asserted labor inefficiencies identified when a Contractor finds its labor expenditure to be in excess of the amount of labor it anticipated that it would expend. Claims of labor inefficiency are recognized to be both difficult to prove as to entitlement and even more difficult to quantify; the claims we confront here are no exception. The parties ably and efficiently presented their positions in both the hearing and the briefs; however, their presentation has not lessened the difficulty of our task.

We have had recent occasion to discuss claims for inefficiency or impact claims in detail in ***Centex Bateson Construction Company, Inc***. We stated there:

> Impact costs are additional costs occurring as a result of the loss of productivity; loss of productivity is also termed inefficiency. Thus, impact costs are simply increased labor costs that stem from the disruption to labor productivity resulting from a change in working conditions caused by a contract change. Productivity is inversely proportional to the man-hours necessary to produce a given unit of product. As is self-evident, if productivity declines, the number of man-hours of labor to produce a given task will increase. If the number of man-hours increases, labor costs obviously increase.

Thus, our inquiry will focus on the evidence to determine whether the VA's actions (or inaction) changed the working conditions such that PKC's labor productivity was adversely impacted. ***Centex Bateson Construction Company, Inc.***, VABCA Nos. 4613, *et. al.*, 99-1 BCA ¶ 30,153, 149,257.

Contentions Of The Parties

PKC contends that three circumstances, for which the VA is responsible, adversely impacted the productivity of its labor constructing VAMC West Palm and caused, at least in part, PKC's (and USM's) overrun of its planned labor expenditure by 97,594 man-hours. First, PKC asserts that the change in construction sequence caused by the Stop Pump Orders resulted in its labor being less productive and required PKC's and USM's excessive expenditures for preparation of coordination drawings. Second, PKC contends that the site was excessively wet, both outside and inside the building, because of the Stop Pump Orders and the VA's improper proprietary roof specification contributed to the inside water intrusion that severely impacted labor productivity. Finally, PKC

avers that the VA's endemic failure to timely respond to RFIs adversely impacted both PKC's and USM's coordination drawing effort and the labor productivity of its installations, causing an increase in their labor coordination drawing costs. PKC provides various detailed quantum analyses and methodologies in support of its request for a judgment of $1,935,092.

The Government responds that any adverse impacts on labor inefficiency experienced by PKC or USM due to the site conditions were caused by Clark, not the VA. In addition, the Government posits that PKC has failed to prove that its labor productivity was adversely impacted by any of the causes for which the VA is allegedly responsible and that PKC and USM bear some of the responsibility for the coordination drawing overruns. Finally, the VA asks us to infer that neither PKC nor USM believe that their inefficiency claims have much substance because they delayed in asserting the inefficiency claims until well after they had asserted other, much smaller claims.

Entitlement

GENERAL

PKC asserts that the VA has liability, because of actions it took or failed to take, for the lower than planned labor productivity it experienced during the construction of VAMC West Palm. The fact that proving the amount of productivity losses is recognized as being notoriously difficult does not abrogate PKC's fundamental responsibility to prove by a preponderance of the evidence that a Government action caused its labor to be less efficient than planned and the extent of that impact. ***Centex Bateson Construction Company, Inc.***, VABCA Nos. 4613, *et. al.*, 99-1 BCA ¶ 20,153; ***Dawson Construction Company, Inc.***, VABCA Nos. 3306-08, 3309-10, 93-3 BCA ¶ 26,177, *aff'd sub nom*, ***Dawson Construction Company v. Brown***, 34 F.3d 1080 (Fed. Cir. 1994); ***Triple "A" South,***

ASBCA No. 46866, 94-3 BCA ¶ 27,194; ***Bechtel National, Inc.***, NASA BCA No. 1186-7, 90-1 BCA ¶ 22,549.

The combined overrun of PKC's and USM's bid labor man-hours on basic Contract work is 97,524. This figure represents an approximate overrun of bid labor hours of 42%, an extraordinary amount. As early as late 1991, a few months after its work began, PKC was aware that its labor budget was "going to hell." PKC primarily relies on the testimony of the PKC and USM project managers (Mr. MacClugage and Mr. Spors for PKC, Mr. Tammaro for USM) and its expert, Mr. Stynchcomb, to prove that a large portion of this overrun is due to VA-caused labor productivity losses. We consider the testimony of the project managers to be candid and forthright. However, PKC made little, if any, effort as we would ordinarily expect, to cite us to contemporaneous project records in support of the testimony. The Record in this appeal is one of the largest ever submitted to this Board. It contains all daily reports by the Government and Clark and its subcontractors, all CPM updates, voluminous correspondence, and all payment requests. Given this voluminous body of evidence, the parties were reminded of the importance of directing the Board's attention to the specific evidence that they believed supported their respective positions. The parties were instructed that it was their responsibility to provide proposed findings of all relevant facts specifically citing supporting Appeal File or Trial exhibits. PKC asserts here that the VA is liable for the loss of labor productivity resulting from it having to work in conditions where there was excessive water in the building and from the VA's failure to timely respond to RFIs. Given the labor overrun that PKC knew had begun very early in the project, we find it difficult to believe that the contemporaneous documentation contained in the Record would not provide relevant evidence supporting both the fact that an impact on productivity occurred and the extent of that impact. Therefore, in this

circumstance, we make the inference that the contemporaneous project records do not support PKC's position. ***Centex Bateson***, 99-1 BCA ¶ 30,153; ***Adams Construction Company***, VABCA No. 4669, 97-1 BCA ¶ 28801; ***Fire Security Systems, Inc.***, VABCA Nos. 2107 *et. al.*, 91-2 BCA ¶ 23743; Michael R. Finke, *Claims for Construction Productivity Losses*, 26 Public Contract L.J. 325-28 (1997).

Mr. Stynchcomb testified that PKC's record keeping, primarily its tracking of labor and material being expended, was better than that of most large mechanical subcontractors. Mr. Stynchcomb also opined that it was not practical to maintain records to track labor productivity by a specific cause. PKC here claims that it and USM are owed over $1.5 million for the portion of the almost 50% overrun in labor allocated to VA liability. PKC knew very early in the project that its labor costs were greatly exceeding estimates, that the entire planned construction sequence changed and that the site was wet. In the face of the alleged, pervasive, VA-caused inefficiency, we reject the notion that PKC, a self-described large, experienced and sophisticated mechanical contractor could not track or document the severe effects on its labor efficiency as they occurred. As is discussed below, the adverse impact on the productivity of PKC's and USM's labor stemming from the two conditions for which the VA is liable, the change in construction sequence and wet exterior site conditions, is clear from the Record. In those circumstances, common sense tells us the causation is proven by the VA's liability. However, proof of the impact of the Contract changes and RFIs for which PKC claims requires PKC to prove the VA's liability for changes and RFI loss of labor productivity. VA liability for changes is established by fact of the change to the Contract. The liability for tardy RFI responses is established by showing that the late responses somehow reflect the VA's failure to fulfill a Contract obligation. PKC also has to prove both that the changes and late RFI responses caused changes to working conditions beyond

the parameters of the conditions the parties could reasonably anticipate and that the changes and late RFI responses lowered the productivity of its labor. The after-the-fact, conclusory assessments of the project managers or the opinion of its experts are not sufficient substitutes for PKC's underlying obligation to contemporaneously document the severe adverse impact on labor efficiency it now claims resulted from the changes and RFIs. ***Centex Bateson***, 99-1 BCA ¶ 30,153; ***Fru-Con Construction Corporation***, 43 Fed.Cl. 306 (1999); ***Triple "A" South***, 94-3 BCA ¶ 27,194, 135,529-30; Michael R. Finke, *Claims for Construction Productivity Losses*, 26 Public Contract L.J. 326-28 (1997).

We note that, because of the nature of Clark's reservation of impact claims, PKC makes no differentiation in its inefficiency claims between direct and cumulative impact. To the extent that it includes loss of labor productivity caused by the combined effect of the change of sequence, wet conditions and late RFI responses in addition to the alleged direct efficiency losses, PKC has not met the test we established in ***Centex Bateson*** to show that the combination of the alleged conditions cumulatively impacted the work and reduced labor efficiency. ***Centex Bateson***, 99-1 BCA ¶ 30,153, 149,258-59.

We draw no inference from the timing of the presentation of the PKC and USM inefficiency claims. We have previously ruled that the inefficiency claims were properly made and that they are properly before this Board. ***Clark Construction Group, Inc.***, VABCA Nos. 5673 ***et. al.***, 99-1 BCA ¶ 30,128.

Our analysis will first explore the productivity of PKC's and USM's installation labor. We will separately deal with the claim for the additional costs of preparing the coordination drawings.

CHANGE IN CONSTRUCTION SEQUENCE

There is no doubt, and the Government does not contest, that Clark's only reasonable response to the Stop Pump Orders was to change to a vertical construction sequence. PKC and USM clearly planned to realize the production efficiencies offered by being able to install long lengths of pipe and duct along the 270 yard length of VAMC West Palm. The change to vertical construction precluded PKC and USM from those efficiencies. The vertical construction, as simple common sense would indicate and as the evidence shows, presented more difficult material handling, crew supervision and work area access problems. These problems translate to lower labor productivity. Thus, we find that PKC has met what we have characterized as the "fundamental triad of proof" to entitle it to recovery for the change in construction sequence. PKC has sufficiently proven that the VA fundamentally changed the conditions under which it expected to perform the work. This change of working conditions caused less productivity and the loss of labor efficiency. However, Clark failed to inform PKC of the sequence change for more than three months; this delay prevented PKC from accommodating or mitigating the effect of the sequence change. Therefore, some of PKC's and USM's productivity losses must be attributed to Clark. ***Centex Bateson***, 99-1 BCA ¶ 30,153, 149,258.

PKC also asserts that the construction sequence change caused it to lose the material handling efficiencies it expected by use of the "bag and tag" method of material ordering and handling. We accept that PKC planned to order its materials such that they would be packaged and delivered to the site in accordance with the planned horizontal sequence. The change to a vertical sequence resulted in the PKC forces having to open material pallets that, for example, contained fittings and other material for the Second Floor of the East Tower in order to obtain fittings for the Fourth Floor of the West Tower. This

effort to find suitable materials to support the vertical construction impacted the efficiency of PKC's crews since time spent in accumulating materials detracted from production time.

However, the change to vertical construction took place well before the major part of PKC's work began. Apparently, PKC took no actions to adjust its material delivery or packaging schedules to mitigate the disruption resulting from its crews having to "scavenge" for materials. Of course, the fact Clark did not seek nor did PKC attempt any input or apparent influence on the development of the vertical construction CPM schedule provides some explanation for PKC's failure to adjust its material deliveries. Also providing some reason for PKC's material handling difficulties, the Record shows that Clark did not progress the job according to the schedule and PKC was reduced to looking out the window to see where Clark was working in order to assign its forces. Thus, PKC has failed to adequately prove that the change in working conditions resulting from the sequence change was the sole cause of its material handling inefficiencies.

The change in construction sequencing had an immediate effect on USM's and PKC's planned prefabrication of large amounts of pipe and duct. We are satisfied from the evidence in the record that PKC and USM were prevented from their planned shop prefabrication of pipe, pipefittings and ductwork because of the Stop Pump Orders. This led to piece-by-piece fabrication that requires more labor effort than installing prefabricated pipe and duct assemblies. In addition, major equipment and material items for the Energy Center were long lead items, which PKC and USM had to order before the change of sequence. With the change of sequence, much of this equipment and material had to be double handled and stored on the site after its delivery. Such a circumstance is obviously less efficient than deliveries packaged and coordinated

with a horizontal construction schedule. Consequently, PKC and USM are entitled to the costs they can prove of the inefficiencies resulting from the VA-caused inability to utilize prefabrication and for the additional handling of long lead items.

WET CONDITIONS

PKC asserts that it encountered "excessively" wet conditions during its work at VAMC West Palm and that these conditions made its labor productivity less than planned. If proven, "excessively" wet conditions would be a change to working conditions that would support an impact claim. The Record establishes that PKC and USM would ordinarily expect that a large segment of its installations, being the largest of a building's systems, would be made prior to a a building being roofed or closed in. In other words, PKC's and USM's forces could anticipate that they would be "working wet" for a good portion of their work.

PKC and USM performed a large part of their work in conditions of water pooling on the first floor depressed slabs and water dripping from floor slab cracks and slab penetrations from the floors above. As noted, PKC characterizes these interior conditions as "excessively" wet, a characterization that invites comparison. What PKC has not provided us, however, is the answer to the obvious question: Compared to what? There is nothing in the Record demonstrating what interior conditions PKC would normally expect and how the conditions at VAMC West Palm were measured or otherwise determined to be excessive. We do not discount the anecdotal assessments of Mr. MacClugage, Mr. Spors or Mr. Conn in their testimony that water caused problems for the PKC and USM forces. However, we have been provided no objective evidence that the wet conditions experienced at VAMC West Palm where so different from

conditions that should have been reasonably anticipated that the basis of the parties' bargain was changed. We note also the litany of problems recited by PKC caused by the pooled water in the depressed first floor slabs. The designed depressed configuration of the first floor slabs was obvious from the Contract documents and even under the most favorable expectations PKC may have had, it would have been working wet on the first floor. Consequently, PKC and USM would have likely encountered pooled water on the first floor even if the Stop Pump Orders had not occurred.

PKC also asserts that the wet conditions in which it was forced to work were caused, in part, by the VA's unreasonable or improper "proprietary" roof specification. In PKC's view, the VA delayed Clark's roof installation by its unreasonable refusal to approve Clark's roof submittals. This delayed roof installation, as portrayed by PKC, was one of the causes of "excessive" water that affected its labor productivity because it expected to be able to accomplish most of its installations after the buildings were roofed. The record does not support that PKC's expectations concerning the installation of the roofs was reasonable. The CPM clearly demonstrates that Clark did not consider roof installation to be on the project critical path and roof installation could have been done well after PKC and USM had completed most of its work. We also note that the CPM does not place the storm drainage system on the critical path and PKC can not claim that it reasonably expected to have the storm drainage available to it to mitigate inside water. The issue of whether or not the roof specification is proprietary is rendered moot by the fact that there were reasonable, substantive reasons other than the FM I-90 compliance of the roof submitted for VA approval supporting the VA's rejection of the roof submittals. Clark never identified that it was submitting a substitute product for the alleged proprietary roof or identified the original roof systems submitted as a functional equivalent of the specified roof

system as provided for under the Contract MATERIALS AND WORKMANSHIP clause. Clark also did not protest the allegedly restrictive roof specification prior to bidding on the project. Thus we find no VA liability for PKC's loss of labor productivity resulting from the Contract roof specifications. ***Jack Stone Company, Inc.***, 344 F.2d 370 (1965); ***Sherwin v. United States, 193 Ct. Cl. 962, 436 F.2d 992 (1971); Blount, Inc.***, VABCA No. 3719, 95-2 BCA ¶ 27,874; ***C&D Construction, Inc.***, ASBCA Nos. 48,590, 49,033, 97-2 BCA ¶ 29,283; ***North American Construction, Corp.***, ASBCA No. 47,941, 96-2 BCA ¶ 28,496.

PKC also points to the Stop Pump Orders as a cause of the alleged excessively wet conditions in the building because they prevented PKC from utilizing the storm risers as temporary roof and deck drains. PKC maintains that it would have installed temporary drains on the storm risers as a tower went up and utilized a sandbag and squeegee method to remove water from the floor slabs if the drains did not have to be plugged to comply with the Stop Pump Orders. We are not convinced that either Clark or PKC ever had the intention of using such a method to mitigate water problems. We note that neither PKC nor Clark took any steps to mitigate water intrusions such as temporary plywood and mastic sealing of floor slabs and slab penetrations. PKC's squeegee plan assertion raises an apparent contradiction in PKC's approach. On the one hand, it asserts that it expected 75% of its installations would be accomplished after the building was under roof. On the other hand, PKC says it was prevented by the Stop Pump Orders from implementing a planned temporary drain regimen that would be unnecessary if they were performing the work while the building was roofed. If PKC anticipated it would, in effect, be "working dry" with the building under roof, there would be no reason to include the labor intensive hub drain/squeegee method to remove water from floor slabs in its bid. All this

leads us to conclude that PKC has not shown that the interior wet conditions it encountered were either excessive or unanticipated.

It is clear from the Record that water was entering the building interior during PKC's work for reasons other than the lack of storm drains and a roof and for which the VA was not responsible. Clark's delay in the exterior wall and window installation was concurrent with the roof/Stop Pump Order problems. We see no rational way in this Record to separate roof/Stop Pump Order water from the open exterior water.

We do find, however, the VA liable for PKC's labor productivity losses resulting from the wet exterior site conditions. The Stop Pump Orders caused the site around the building to be mucky because Clark was prevented from operating its site-wide de-watering system. Here PKC had a reasonable anticipation that the site would be dry since it is clear that the "sock" system installed by Clark would have had the capability to de-water the site if it could have been operated. The Stop Pump Orders led to problems in traversing the site, materials handling and material storage from May 1991 to October 1992, the period in which SFWMD prevented site de-watering. It takes no special expertise to conclude that a wet, muddy site will make the handling of material less efficient and to the degree the costs are proved, PKC and USM are entitled to the additional costs resulting from the muddy site conditions.

To summarize, we find that PKC has proven neither that the working conditions, as they relate to water intrusion, inside the building were different than what it should have reasonably anticipated with regard to wet conditions nor has it proven that VA actions were the sole cause of the alleged excessively wet conditions. Therefore, we do not find that PKC has met the burden of the entitlement triad for lost productivity attributed to working in wet conditions inside the building. PKC has proven, however, that the muddy condition of the

site around the building was a change from the conditions that it reasonably anticipated and it is entitled to recover for its lost productivity caused by the muddy site conditions.

DISRUPTION DUE TO LATE REQUEST FOR INFORMATION RESPONSES

The thrust of PKC's presentation at hearing and its argument in the BRIEFS, is that the bulk of the claimed unproductive labor hours stemmed from the labor disruption caused by the VA's failure to provide necessary information to PKC and USM in a timely manner. PKC makes no claim that the VA is liable for lost productivity based on the number of Contract changes or RFIs issued relating to the project. PKC grounds its entitlement claim relating to RFIs on the disruption to its labor productivity because the VA was late in responding to its RFIs. Thus our analysis of this issue in this entitlement discussion will explore the evidence of whether the VA was late in responding to RFIs and whether any such late response caused a change in working conditions that adversely impacted PKC's and USM's labor productivity. ***Centex Bateson***, 99-1 BCA ¶ 30,153; ***P.J. Dick Contracting, Inc. VABCA Nos. 3177-82***, 92-2 BCA ¶ 24,827; ***Hensel Phelps Construction Company,*** ASBCA No. 49270, 99-2 BCA ¶ 30,531; *recon. dn.*, 00-1 BCA 30,733.

In PKC's view, the VA obligated itself to respond to Clark's RFIs in fourteen days. This obligation, according to Mr. MacClugage, arose based on statements by Clark representatives to him that the VA would respond to RFIs in fourteen days. We find nothing in the Contract documents nor did PKC point to any contemporaneous document in the Record to support that the VA undertook a Contractual obligation to respond to RFIs in fourteen days. Consequently, in the absence of any specific Contractual obligation regarding response to RFIs, the VA had a duty to respond to RFIs in a reasonable time. We reject any notion that

the VA's failure to respond to 74% of PKC's and USM's RFIs within fourteen days automatically establishes VA liability for loss of labor productivity relating to any or all of those 76% of the RFIs. ***Turbine Aviation***, ASBCA No. 51,323, 98-2 BCA ¶ 29,945; ***Maitland Bros. Co. et. al.***, ASBCA Nos. 30,089 *et. al.*, 90-1 BCA ¶ 22,367.

There is no question, and the VA does not contest, that the VA took extended periods to respond to some RFIs, primarily because of the failure of the VA's A/E to act promptly. The average response time to RFIs relating to the ten systems or areas impacting PKC ranging from 38-235 days and the 45-50 day average response time for USM related RFIs appears, at first glance certainly raises questions. However, the reasonableness of RFI response time, in terms of disruption of installation labor, must be gauged from the context of when the RFI was submitted and when the work was to be performed. Most of the RFIs at issue here were submitted beginning in the last quarter of 1991 through 1992. The VA's failure to respond until mid-1992 to an RFI submitted in December 1991 relating to an installation scheduled, for example, for December 1992 is not necessarily unreasonable and, by itself, does not result in VA liability for a labor disruption experienced in that installation. PKC simply identifies RFIs for which responses were received more than 14 days after they were submitted that, in Mr. MacClugage's estimation, "impacted" PKC's productivity.

PKC points to the duct component/MER, the wall thickness and the piping interference with the building structure questions as the late RFI response issues causing the most problems and impact on labor efficiency. However, the duct component RFIs were resolved prior the construction of most of the MERs. PKC fails to address the issue of the clear language of the IFB amendments placing responsibility for coordinating wall thickness and pipe size on Clark and specifically requiring Clark to coordinate ductwork offsets to avoid conflicts in

terms of the VA's liability for those two issues identified by PKC as major elements of labor disruption for which it seeks compensation. Moreover, the fact that only forty of the RFIs identified by PKC as impacting its work resulted in Contract changes raises the issue of whether the RFIs simply reflected the normal interaction and coordination expected on a complex construction project.

Similarly, PKC has to prove that the late RFI response caused the disruption of its labor. As reflected in the findings of fact, Mr. MacClugage and Mr. Tammaro recited a litany of disruptions because of late RFI responses. However, this testimony was not corroborated or buttressed by reference to contemporaneous documentation. Disruption of the nature and extent alleged in the testimony should leave a trail through the project documentation. We would expect daily logs, CPM fragnets, correspondence and other contemporaneous Contract documentation to support that the late RFI responses changed the expected working conditions and that the change to working conditions disrupted PKC's and USM's labor and the extent of the disruption. Our expectation in this regard is heightened by the fact that most of the late RFI problems were experienced at the initial stages of the project and PKC knew very early in the project that its labor costs were running substantially above budget.

As we stated earlier, we will infer, in light of PKC's failure to cite any of the extensive contemporaneous Contract documentation in the record to support late RFI response caused disruption, that the documentation in the record does not support the disruption. Mr. MacClugage testified that PKC found itself making three and four "passes" through an area to complete its work instead of the two "passes" it would normally expect, a circumstance he attributes to late RFI responses. Although it is a logically attractive proposition to conclude that additional passes indicate a loss of labor efficiency, we are unable to make such a conclusion in the absence of evidence linking the lateness of a particular RFI

response as the cause of an additional pass or passes to the exclusion of other causes.

What PKC has presented are general reminiscences of perceived problems it had from late response to RFIs. We have no corroborating evidence supporting that any late RFI response caused the loss of labor productivity in any particular item of work or area of the project. Mr. MacClugage's analysis on which PKC rests its claim was based on his review of the RFIs, his recollection of the circumstances on the job and his characterizations of the alleged impact subsequent to the initiation of this litigation. PKC provides no basis in the contemporaneous project records to confirm or reject Mr. MacClugage's analysis. Mr. MacClugage's analysis, however straightforward, is insufficient proof for us to find that: 1) The VA was late in responding to any particular RFI; 2) Such late response changed the reasonably anticipated working conditions beyond those contemplated in the parties' Contractual bargain; and, 3) PKC's labor productivity was adversely affected by this change in working conditions. Moreover, PKC acknowledges that Clark's failure to follow the CPM schedule, late roof submittals, late installation of exterior wall panels and windows and failure to place the interior building stairs in a timely fashion, all contributed to PKC's and USM's loss of productivity. We also find that Clark failed to adjust the number and positioning of manlifts when it went to vertical construction. This constituted another adverse impact on labor productivity because it limited internal communication within the building. PKC simply fails to differentiate these non-VA liable causes of productivity losses from the alleged VA caused loss of productivity in its proof that the VA's late RFI responses resulted in its efficiency losses. From all this, we conclude that PKC has failed to prove by a preponderance of the evidence that the VA's response to any particular RFI was

unreasonably late or that a late RFI response by the VA caused a loss of labor productivity. ***Centex Bateson,*** 99-1 BCA ¶ 30,153.

COORDINATION DRAWINGS

Preparation of coordination drawings in this Contract takes on special significance because of the use of interstitial spaces. The complexity of utility installation here in the interstitial spaces and the restrictions on the placement of the runs of the various trades to specific interstitial zones place special responsibilities on a Contractor in coordination drawing preparation. Concurrent with these special contractor responsibilities is a contractor's reasonable expectation that the drawings and specifications for interstitial spaces will be of sufficient quality permitting them to discharge their responsibilities. This combined with the Contract terms requiring VA approval for all but extremely minor deviations in utility locations in the interstitial space and the requirement for approved coordination drawings before installations can take place all point the critical nature of coordination drawing preparation in the context of this Contract. In the face of this, disruption of the coordination drawing process takes on much more importance than the usual shop drawing/submittal process found in most construction projects. ***Turner Construction Company, Inc., et. al.***, ASBCA Nos. 25447, *et. al.*, 90-2 BCA ¶ 22,649.

PKC was aware of the need for an early, concerted coordination drawing effort since it and USM would be the initial trades to prepare their portion of the coordination drawings. Both planned an appropriate level of resources in their respective bids and early preparation to accomplish the coordination drawings.

PKC and USM had already begun their coordination drawing efforts, properly based on the planned horizontal construction sequencing, when the sequencing changed to a vertical construction sequence. The record supports

PKC's assertion that the sequence change, for which the VA is liable, disrupted USM's preparation of background drawings, the first important step in coordination drawing preparation. This disruption led to USM being required to extend extraordinary efforts to complete its background drawings. The construction sequence change disruption also led directly to PKC having to retain an outside drawing company to progress the coordination drawing effort.

The bulk of the RFIs at issue here were initiated as part of the coordination drawing preparation process. Although we have found that PKC has failed to prove that dilatory VA response to RFIs resulted in disruption of installation labor, it is clear that the VA's late RFI responses did disrupt and delay the preparation of coordination drawings.

The VA asserts that PKC should bear some of the responsibility for additional coordination drawing preparation effort. It bases this assertion on Clark's failure to obtain PKC's input into the vertical sequence schedule and on PKC's lack of direct, prior experience on projects where interstitial spaces were required. We agree. Clark failed to inform PKC of the sequence change for several months and did not coordinate the vertical construction schedule with PKC. This resulted in PKC continuing to pursue preparation of coordination drawings according to the horizontal sequence and obviated any chance for PKC and USM to plan for more efficient production of coordination drawings for the vertical sequence or to otherwise mitigate the impact of the sequence change.

We find the construction sequence change and the need for and late response to RFIs to be constructive Contract changes entitling PKC to direct compensation for its additional coordination drawing preparation costs. However, we find that some of those additional costs are attributable to the actions of Clark as discussed hereafter. ***Centex Bateson***, 99-1 BCA ¶ 30,153, 149,256.

Quantum

GENERAL

PKC presents three alternative methodologies to quantify the amount of lost labor productivity and asks us to utilize a "jury verdict" approach to calculate an award. Presenting a picture of a pullulating, water logged horde of aimlessly milling laborers and pencil poised draftsmen all anxiously awaiting VA direction through the RFIs, PKC at the hearing and in its BRIEFS clearly contemplate recovery for all impact, both direct and cumulative. PKC approaches the three analyses it offers using total incurred labor hours or costs at the starting point. Thus to some degree, each of the three methodologies is a variant on a total cost/total entitlement claim. Since we have found that PKC has not proven entitlement to all the asserted causes of inefficiency, PKC's quantum presentation is of diminished utility. Consequently, it is unnecessary for us to discuss the validity, reasonableness and accuracy of PKC's quantum computations in detail. Indeed, PKC's request that we employ a "jury verdict" method to arrive at a quantum amount is a tacit acknowledgement of the deficiencies contained in each of the three methodologies advanced.

Quantification of loss of efficiency or impact claims is a particularly vexing and complex problem. We have recognized that maintaining cost records identifying and separating inefficiency costs to be both impractical and essentially impossible. Therefore, we have found percentage estimates of loss of efficiency to be an appropriate method to quantify such losses and that is how we will calculate the amount of equitable adjustment due PKC here. ***Centex Bateson***, 99-1 BCA ¶ 30,153; ***Fire Security Systems, Inc.***, VABCA No. 3086, 91-2 BCA ¶ 23,743.

We will utilize the productivity factors from the MCAA Manual as the best method to arrive at the percentage estimates of PKC's and USM's undeniable productivity losses. We find no other basis in the record on which we could better calculate the amount of PKC's productivity losses in this appeal and, as we previously recognized in ***Fire Security***, the MCAA productivity factors are a reasonable starting point to estimate efficiency losses. Despite the inherent subjectivity of the MCCA factors, the Record here demonstrates that the MCAA factors are a widely used industry standard method of accounting for the impact of inefficiency on mechanical work. We will utilize the MCAA Manual's direction and descriptions of the percentage inefficiency factor to be applied to the inefficiency element for which entitlement has been proven. As contemplated by the MCAA Manual, we will use our reasonable judgment of how the factors apply to this Contract and the two contractors. ***Fire Security Systems, Inc.***, 91-2 BCA ¶ 23,743; ***Stroh Corporation***, GSBCA No. 11029, 96-1 BCA ¶ 28,265.

We have clear evidence of PKC's entitlement to an equitable adjustment. In light of this and the recognition of the impossibility of the precise quantification of impact or inefficiency costs, our determination of quantum for labor productivity losses in this appeal by making estimates based on the MCAA factors will properly be in the nature of a jury verdict. ***Valley Forge Flag Co., Inc.***, VABCA Nos. 4667, 5103, 97-2 BCA ¶ 29,246; ***Consultores Profesionales De Ingenieria, S.A.***, ENGBCA No. PCC-78-R, 97-2 BCA ¶ 29,011; ***Dawco Construction v. United States,*** 930 F.2d 872 (Fed. Cir. 1991), *overruled on other grounds*; ***Reflectone, Inc. v. Dalton***, 60 F.3d 1572 (Fed. Cir. 1995).

CHANGE IN CONSTRUCTION SEQUENCE

We have found that the change from a horizontal to vertical construction sequence caused by the VA would result in reduced productivity because of more difficult internal communication within the building and more difficult control of labor forces arrayed over different floors. We conclude that the applicable MCAA Factors are "Dilution of Supervision" and "Site Access." Reviewing the description of these factors in the MCAA Manual we find them to be descriptive of the conditions resulting from the change in sequence, including the inability to prefabricate pipe and duct. Because the sequence change occurred early in the project permitting PKC and USM to adjust to the condition we will class the percentage of loss for both of these conditions as "Minor." MCAA attributes a 10% loss of efficiency for a minor Dilution of Supervision Condition and a 5% loss of efficiency for a minor Site Access problem. Thus the productivity of PKC's and USM's installation labor was adversely impacted by a factor of 15%. As PKC has acknowledged, however, concurrent with the inefficiencies resulting from the change in sequence, were other causes of affecting labor productivity not attributable to the VA. These other causes: Late stair installation; Late building dry-in; Lack of CPM coordination or adherence; and, Man-lift congestion problems, lead us to adjust the 15% inefficiency factors for this project as contemplated in the Manual. In our view, when taken together, these non-VA causes of labor inefficiency equal the impact of the change in sequence and we adjust the 15% indicated inefficiency factor for the construction sequence change and find that the change to vertical construction impacted PKC's and USM's efficiency by 7.5%.

The MCAA Manual contemplates that inefficiency will be applied to estimated hours to determine the number of hours attributable to the inefficiency. The change of construction sequence pervaded the entire project. In

the absence of any VA evidence or argument to the contrary and based on the evidence in the record, we find PKC's bid to be reasonable. The sequence change altered the working conditions on which PKC's bid was predicated; thus, the proper measure of the inefficiency is to apply the MCAA factors to the bid, in the manner contemplated in the MCAA Manual. We apply the 7.5% inefficiency factor to the hours PKC originally estimated would be necessary to complete the project in order to estimate the additional cost of the sequence change caused labor inefficiency.

PKC estimated that 181,974 man-hours of labor would be required to complete its work at VAMC West Palm. We accept this estimate on the basis that the Record demonstrates that PKC's bid for the project was reasonable. Applying the 7.5% inefficiency factor to the bid hours in the manner contemplated in the Manual, PKC is entitled to receive payment for 13,648 man-hours of unproductive labor stemming from the change in construction sequence. At PKC's composite labor rate of $20.08, PKC is entitled to $274,052.

USM estimated that it would require 53,004 man-hours to complete its work at VAMC West Palm. Thus the change in sequence caused an estimated 3,975 man-hours of unproductive labor. At its composite labor rate of $26.46, USM is entitled to $105,179.

WET CONDITIONS

The wet exterior site conditions entitle PKC to recover the costs of the labor inefficiency attributable to those conditions. The Morale and Attitude Factor includes "poor site conditions" in its description and PKC utilized this factor to account for the mucky site conditions in its MCAA analysis. The Manual Morale and Attitude Factor best fits the inefficiency impact of the mucky exterior site conditions. From the evidence in the record, we apply a 5%

inefficiency factor, classifying the condition as "Minor" based on the Manual's directions. The site was wet until November 1992 when Clark was allowed to conduct site de-watering. The wet exterior site conditions impacted PKC's productivity from July 1991, when its installations began, to November 1992. In that period, PKC estimated that it would expend 91,000 man-hours of labor. Thus, applying the 5% inefficiency factor, the change to expected working conditions evidenced by the mucky site results in an estimated 4,550 unproductive man-hours. This translates to an inefficiency cost of $91,364.

We will accept the claimed $10,000 as the measurement of additional costs incurred by USM due to the wet site conditions.

COORDINATION DRAWINGS

The VA has not contested the claimed amounts of $121,625 and $151,835 of direct excess coordination drawing costs claimed for PKC and USM respectively. We accept these amounts as the total costs of PKC's and USM's additional coordination drawing effort caused by the change in construction sequence and late RFI responses. As we noted, in the discussion of entitlement, some of these additional costs are the responsibility of Clark and PKC. Neither party provides us with compelling evidence on which to base an allocation of additional coordination costs between the VA and PKC. Therefore, in consideration of the Contract placing the risk on PKC to accommodate reasonable additional coordination drawing efforts, the fact that the Contract, in two areas of the specifications identified as presenting particular coordination drawing efforts, places the risk on the contractor for efforts required there, the problems attendant to Clark's late notice of the sequence change and Clark's failure to adhere to the schedule, we will allocate, on a jury verdict basis, 15% of the additional coordination drawing costs to Clark and PKC. This results in PKC

being entitled to an equitable adjustment of $103,381 for its additional coordination drawing effort and $129,060 for the additional effort of USM.

OVERHEAD, PROFIT AND FEES

The loss of efficiency and the additional coordination efforts are constructive changes to the Contract. Consequently, the Contract CHANGES – SUPPLEMENT (FOR CHANGES COSTING $500,000 OR LESS), VAAR 852.236-88(a) clause applies to the computation of the amount of any equitable adjustment to which PKC is entitled. Under that clause, overhead and profit percentages are limited for the party performing the work. In addition, only one fee, limited by percentages, is permitted for the prime contractor or upper tier subcontractor. The VAAR requires computation of overhead, profit and fees in the following manner:

First $20,000:	10%
Next $30,000	7.5%
Remaining Balance	5%

The computation of the total equitable adjustment set forth below will be made in accordance with the clause. We also round any amounts to the appropriate dollar.

EQUITABLE ADJUSTMENT CALCULATION

USM		
Change in Sequence:	$105,179	
Wet Conditions:	10,000	
Coordination Drawings	129,060	
Subtotal	244,239	
USM Overhead Per VAAR:	13,912	
Subtotal	258,151	
USM Profit Per VAAR:	14,608	
Subtotal	272,759	
PKC Fee Per VAAR	15,338	
Subtotal	288,097	
Clark Fee Per VAAR	16,105	
Total USM		304,202
PKC		
Change in Sequence:	$274,052	
Wet Conditions:	91,364	
Coordination Drawings	103,381	
Subtotal	468,797	
PKC Overhead Per VAAR:	26,140	
Subtotal	494,937	
PKC Profit Per VAAR:	26,447	
Subtotal	521,384	
Clark Fee Per VAAR	27,769	
Total PKC		549,153
Total Equitable Adjustment		$853,355

CDA INTEREST

With the determination that PKC is entitled to an equitable adjustment, the question arises of the date from which interest under the *CONTRACT DISPUTES ACT (CDA)* is calculated. As noted in our earlier decision concerning Clark's appeals arising out of this Contract, we found that the PKC inefficiency claims that are the subject of this proceeding were included in Clark's November 21, 1995 and May 10, 1996 claims. The November 21, 1995 Clark claims related to the Stop Pump Orders. Since the claims for which we find PKC entitled here arose out of the Stop Pump Orders and the Sequence Change, we find that they were encompassed in Clark's November 21, 1995 claims. Consequently, we find that *CDA* interest shall be calculated from November 21, 1995.

Clark Construction Group, Inc., 99-1 BCA ¶ 30,128.

DECISION

For the forgoing reasons, the Appeal of Clark Construction Group, Inc., VABCA-5674, under Contract No. V101BC-0036, is SUSTAINED. Appellant Clark Construction Group, Inc. is entitled to a judgment of $853,355 plus interest under the *CONTRACT DISPUTES ACT* from November 21, 1995.

DATE: **April 5, 2000**

_____
RICHARD W. KREMPASKY
Administrative Judge
Panel Chairman

We Concur:

_____
GUY H. MCMICHAEL III
Chief Administrative Judge

_____
JAMES K. ROBINSON
Administrative Judge